

WalkBikeNC

NORTH CAROLINA STATEWIDE PEDESTRIAN AND BICYCLE PLAN



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"All efforts to create a healthier North Carolina deserve our total support. We live in a wonderful country and a fantastic state. Each of us is needed to be at our best all the time. When we walk, run, and bicycle, we are saying to ourselves and to each other, we care enough to be the best for our self and for each other."

~ Maya Angelou, 11/13/12



Chapel Hill, NC

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1 Introduction & Overview



NORTH CAROLINA: A GROWING POPULATION

The 21st Century has brought and will continue to bring meaningful changes to North Carolina's communities. Over the next few decades, significant trends will unfold that will create both opportunities and challenges for the state. One of the foremost influences on North Carolina's future will be continued population growth, fueled by migration from other states and abroad.

In 2010, North Carolina ranked as the tenth most populous state in the country with 9.5 million people. By 2030, it will be home to an estimated 12.2 million people, surpassing Michigan, Ohio, and Georgia to become the seventh most populous state.



This growth will be coupled with a continued population shift from rural to urban areas. **In 1990, 50.3% of North Carolina's population resided in urban areas. By 2000, that percentage had increased to 60.3% and is expected to reach over 75% by 2040.** In addition, population density has reversed its downward trend in North Carolina's major cities since 1940. Population density and migration to urban centers began increasing in 1990 as sprawl decreased. A larger, increasingly urban population will be joined by a number of trends that will influence the mobility, health, living preferences, and economic vitality of North Carolinians and their communities. These trends are all pointing the way towards the need for better places for North Carolina residents to walk and bike.

In this Chapter

North Carolina: A Growing Population

Age Composition

Housing Choice

Health Status

Economic Snapshot

Walking & Bicycling: What North Carolinians are Saying

Plan Purpose: Why a Statewide Pedestrian and Bicycle Plan

Vision & Goals

Who is Involved in the Plan and What is the Planning Process?

What does the Plan Include?

What's next?

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In Raleigh and Charlotte, two of North Carolina's fastest growing cities, population density is increasing even when taking into account the massive growth in square miles for each of these cities over the past two decades (see table below). Similarly, increases in housing density can be seen statewide over the past half century (see maps at right). These increases in density may offer opportunities for shorter trips to work, school, shopping, and other destinations. With a mix of land-uses and the appropriate infrastructure, such trips could be made in these higher density areas by walking and bicycling, rather than driving.

Raleigh Population Density:

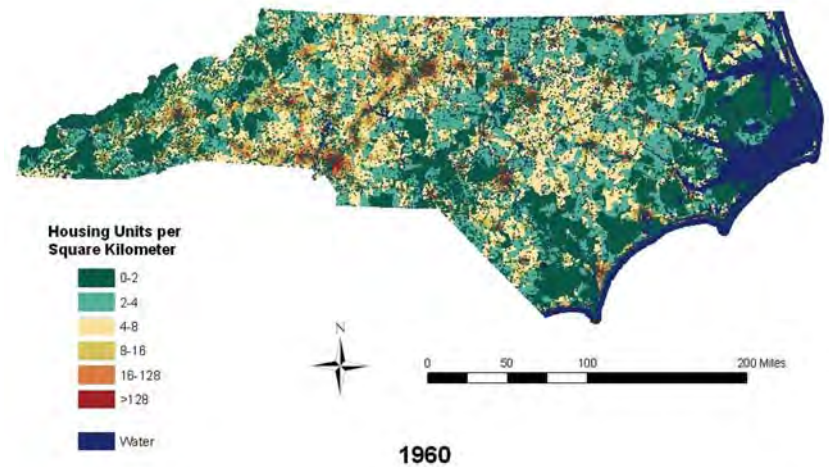
Year	Population	Area (Square Mile)	Density (Population/ Square Mile)
1990	207,951	88.14	2,359.5
2000	276,093	114.6	2,409.2
2010	403,892	142.9	2,826.3

Charlotte Population Density:

Year	Population	Area (Square Mile)	Density (Population/ Square Mile)
1990	395,934	174.26	2,272.1
2000	540,828	242.27	2,232.4
2010	731,424	297.68	2,457.1

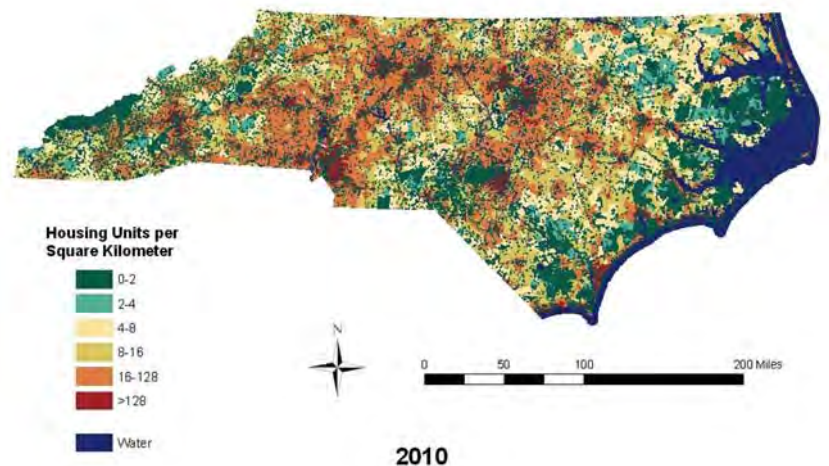
▲ Increase in Population Density, 1990-2010. Both population and population density have been increasing.

Sources: 2010 US Census; Mitchell Silver, AICP. Planning Raleigh 2030: Designing a 21st Century: www.tricc.org/docs/TCCJan182008.pdf.



1960

▲ Housing Units per Square Kilometer in 1960



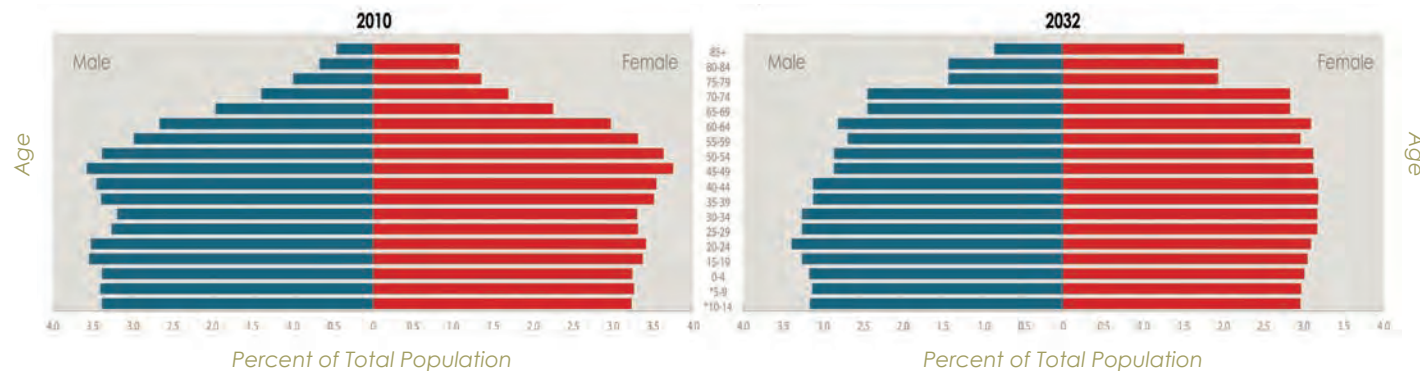
2010

▲ Housing Units per Square Kilometer in 2010
This shows a dramatic increase in urbanization and population density.

AGE COMPOSITION

Another trend indicating a need for better walking and bicycling options is our changing age composition. As seen in the US Census information below, in 2010, the 65+ age group in North Carolina accounted for 13% of the population. In 2032, this number is projected to be nearly 20%. As these older adults begin to drive less, their access to independent mobility will be greatly influenced by how well our streets and transportation networks accommodate pedestrians, and impaired pedestrians in particular.

North Carolina Population Pyramids, 2010 and 2032



Age Group	2010	Percentage
Under 18	2,281,635	23.9%
18-24	938,618	9.9%
25-44	2,573,744	27.0%
45-64	2,507,407	26.3%
65+*	1,234,079	12.9%

Age Group	2032	Percentage	Change from 2010
Under 18	2,614,632	22.1%	14.6%
18-24	1,083,644	9.1%	15.5%
25-44	3,017,305	25.5%	17.2%
45-64	2,786,665	23.6%	11.1%
65+	2,328,177	19.7%	88.7%



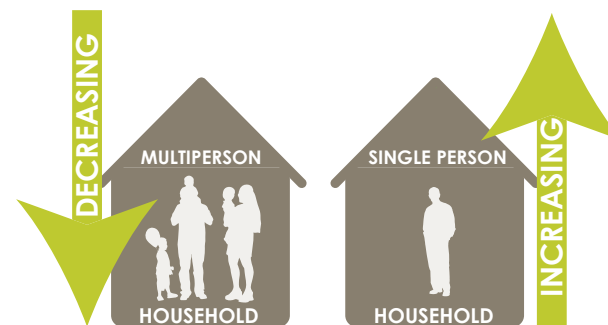
Age Population Pyramid for North Carolina, 2010; and projected for 2032. Sources: US Census Bureau, 2010; http://www.osbm.state.nc.us/demog/countytotals_agegroup_females_2032.html

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One of the most important emerging trends in our state is an increasing number of North Carolinians age 65 or older: this segment of the population is anticipated to increase from 13% in 2010 to nearly 20% by 2032, representing more than 2.3 million people.

As they age, many of these older North Carolinians will choose not to drive or find themselves unable to drive. Yet they will still require safe, alternative forms of transportation. More than one in five (21%) Americans age 65 or older do not drive due to declining health, declining mental capacity, safety concerns, lack of access to a car, or personal preference.³ Communities that offer walk-friendly and transit access to health care, healthy foods, community centers, and social activities will be crucial for the physical health, mental health, and wellbeing of our senior population.

In addition to many senior citizens, alternative transportation options are also essential for many other Americans who do not drive. One-third of Americans currently do not drive because of age, economics, disability, or choice.¹ This includes more than 60 million Americans who are too young to drive and 8 million adults over the age of 60 that do not have a driver's license.² Walking and bicycling improvements will help to provide a more equitable transportation system that addresses the mobility and access needs of drivers and non-drivers alike.



▲ By 2025, single person households are expected to overtake multiple person households as the majority.

HOUSING CHOICE

An increase in the percentage of households with a single occupant is another change that will affect the transportation needs and preferences of North Carolina's population. The rise in single person households will influence where people choose to live, the types of housing they prefer, and how they get around. Smaller housing units in more walkable neighborhoods will be in greater demand, and households with a single income will likely desire more affordable transportation options than the private car. Two-thirds of Americans already consider the walkability of an area in their housing decision, with grocery stores, pharmacies, hospitals, and restaurants being the most-desired places within a short walk from home.⁴ NCDOT can accommodate this growing demographic by creating communities where North Carolinians can safely and regularly walk and bike for fun or utility.

More than one in five (21%) Americans age 65 or older do not drive. Below, older adults take part in a walking program in Spring Lake, NC.



Communities that offer walk-friendly and transit access to health care, healthy foods, community centers, and social activities will be crucial for the physical health, mental health, and wellbeing of our active adult population. Photo in Asheboro, NC.



HEALTH STATUS

From 1995 to 2010, the instance of obesity in North Carolinians increased from 16.9% to 28.6% of the population.⁵

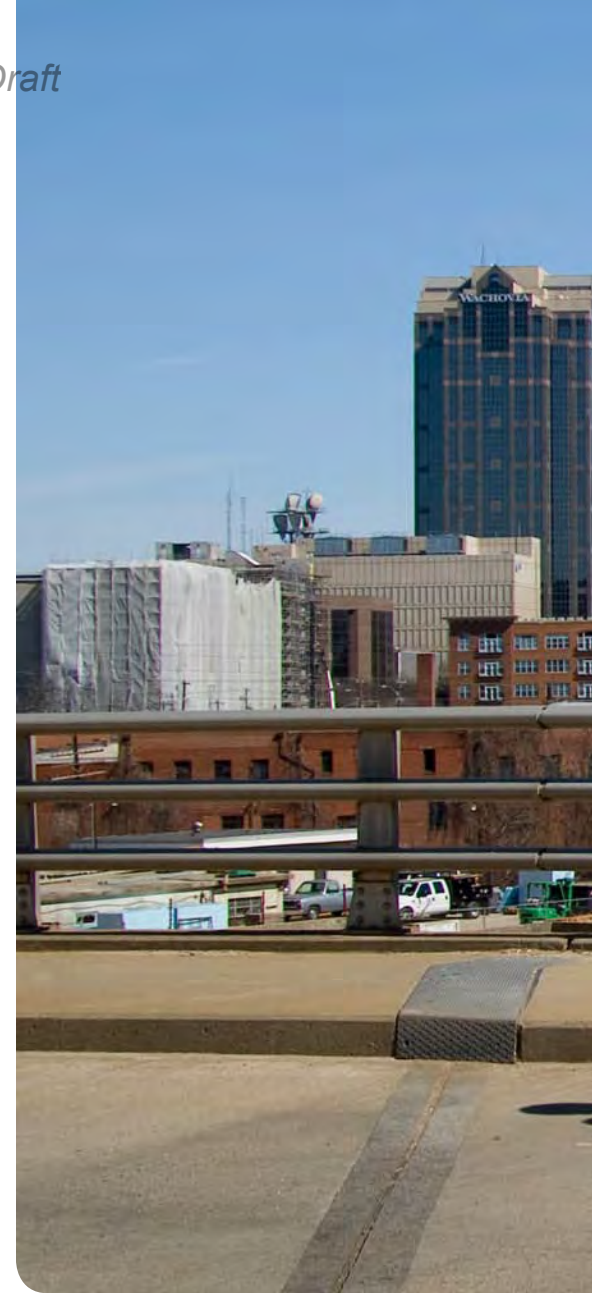
More than 65% of North Carolinians are overweight or obese.⁵

Physical inactivity, overweight, and obesity rates have major implications for the health of North Carolinians, leading to an increased risk of heart disease, diabetes, and other serious health conditions. Without safe environments where physical activity such as walking and biking can be incorporated into daily life, these rates will likely remain at epidemic levels. The Centers for Disease Control and Prevention recommend at least 30 minutes of moderate physical activity each day. In many areas, more and better pedestrian and bicycle facilities are needed so that people can incorporate physical activity into their daily routines.

ECONOMIC SNAPSHOT

Economic development will also continue to be a priority for North Carolina. Over the past few decades, North Carolina has diversified from a traditionally agricultural and manufacturing economy to a knowledge-based economy of global importance. North Carolina's success hinges upon its ability to retain workers educated and trained in the state as well as to attract talented workers from around the country and the world. Increasingly, companies and workers are seeking out places that offer a sense of community, a supportive environment for active living, and amenities close to home, including schools, shops, restaurants, parks, and entertainment. In fact, a majority of homebuyers (58%)

Incorporating walking and biking into daily life can combat the obesity epidemic in North Carolina. Photo in Raleigh, NC.





1

now prefer mixed-use communities that include stores and other businesses within walking distance.⁴

Pedestrian and bicycle facilities such as trails are consistently ranked the most important community amenity by prospective homebuyers, above golf courses, parks, security, and others.

HOME BUYER SURVEY



Trails



Golf Course



Swimming Pool



Parks



Security

By making targeted improvements to the accessibility of key destinations, increasing opportunities for active mobility options, and enhancing community safety and health, North Carolina can build upon its reputation as a premiere high-quality-of-life location for residents, workers, and tourists alike.

WALKING AND BICYCLING: WHAT NORTH CAROLINIANS ARE SAYING

These demographic, health, and economic trends affecting North Carolina's population underscore the need for targeted, forward-thinking investments that will make North Carolina's communities safer, healthier, more economically robust, and more accessible for everyone. Demand for better walking and bicycling conditions has already been expressed across the state.

According to a survey of 16,000 North Carolina residents, the most commonly reported safety issue for walking and bicycling was inadequate infrastructure (75%).⁶

However, a 2011 public survey conducted by NCDOT found that the majority of respondents rated North Carolina's pedestrian and bicycle facilities as below-average quality or lower.⁷

The 2011 Bicycle and Pedestrian Safety Survey found a similar mismatch between current walking and bicycling conditions and the safety needs of North Carolinians. This survey of 16,000 residents, developed by the Institute for Transportation Research and Education (ITRE) at North Carolina State University, found significant concerns about safety. More than 60% of respondents felt that bicycling for any purpose was somewhat or very dangerous. A similar question on pedestrian conditions found more than 30% of the state felt the same way about walking. The two most commonly reported safety issues were inadequate infrastructure for walking and bicycling (75%) and lack of pedestrian and bicycle connectivity between activity centers/commercial centers and residential neighborhoods (70%).

Furthermore, a recent national study has found that younger people are avoiding or postponing buying cars and acquiring driver's licenses. The study, "Transportation and the New Generation", found that from 2001 to 2009, the

average annual number of vehicle miles traveled by young people (16 to 34-year-olds) decreased from 10,300 miles to 7,900 miles per capita—a drop of 23 percent. Such a shift is one more indicator of a need for a similar shift in transportation policy.

Historically, only 0.2% of NCDOT funding has been allocated for independent pedestrian and bicycle improvements

while citizens have requested much higher allotments when surveyed. This underscores the significant gap that exists between North Carolinians' desire to walk and bike and the infrastructure available to safely do so. Safety data show that these concerns are not unfounded; the Alliance for Biking and Walking listed North Carolina 41st lowest in its ranking of pedestrian safety by state and 44th lowest for bicycling safety.⁸

In a 2007 survey by the State Center for Health Statistics, 60% of North Carolinians reported that they would increase their level of physical activity if they had better access to walking and bicycling facilities such as sidewalks and trails.

Walking, biking, greenways, and trails consistently appear as top priorities for communities in North Carolina. Below: The Lake Trail in Lake Crabtree County Park.



PLAN PURPOSE: WHY A STATEWIDE PEDESTRIAN AND BICYCLE PLAN?

The 2013 *North Carolina Statewide Pedestrian and Bicycle Plan* identifies current conditions for walking and bicycling in North Carolina and serves as a policy guide for NCDOT in developing a transportation system that safely accommodates walking and bicycling statewide. Pedestrian and bicycle planning at the state level can help to bridge the disconnect between current conditions and what North Carolinians envision for walking and bicycling in terms of safety, mobility, and connectivity. By providing a “big picture” perspective of walking and bicycling in North Carolina, NCDOT can better determine the walking and bicycling needs of North Carolinians and the policies, projects, and programs that best meet these needs. A statewide plan is also important for establishing standards and providing accountability. Because NCDOT controls the majority of roadways in the state (more road miles than any other state except Texas) and funds many of the multi-use pathways, a consistent statewide approach is imperative.

The 2013 *Statewide Pedestrian and Bicycle Plan* provides an update to the 1996 *Bicycling and Walking in North Carolina: A Long-Range Transportation Plan*. Since the 1996 plan, many improvements have been made to address walking and bicycling at the local, regional, and state levels in North Carolina. The 2013 Plan aims to build upon these successes and identifies targeted goals and actions for improving walking and biking conditions in North Carolina, thereby supporting NCDOT's mission of “Connecting people and places safely and efficiently, with accountability and environmental sensitivity to enhance the economy, health, and well-being of North Carolina.”

VISION AND GOALS

The vision and goals for the *Statewide Pedestrian and Bicycle Plan* were developed based on input from the Joint Steering Committee and Advisory Committee, the 2011 Bicycle and Pedestrian Safety Summit report, and public outreach. The vision statement outlines how walking and bicycling will be integrated into North Carolina's transportation system and how these improvements will affect North Carolina's future. The vision statement includes five vision themes that appear throughout the plan: **Mobility, Safety, Health, Economy, and Environment**. These five goals make up the framework of the plan. Together these five components describe the conditions that need to be satisfied in order for North Carolina to achieve its vision for walking and bicycling. Finally, the objectives listed for each goal provide specific strategies and measurable actions to track the plan's progress, support its goals, and achieve its overarching vision.

Themes/Pillars



Vision

North Carolina is a place that incorporates walking and bicycling into daily life, promoting safe access to destinations, physical activity opportunities for improved health, increased mobility for better transportation efficiency, retention and attraction of economic development, and resource conservation for better environmental stewardship of our state.



Next to the Capitol building, in Downtown Raleigh.

Goals



Improve mobility strategically with greater investment in walking and biking infrastructure (through a Complete Streets approach), improved transportation equity and choice, connectivity between transportation modes, reduced traffic congestion, and through better coordination between land use and transportation planning.



Improve safety for all roadway users through strategic, consistent, and connected pedestrian and bicycle facility improvements, education, and enforcement strategies.



Contribute to public health by providing active living environments with safe, connected, accessible facilities along with programs that encourage walking and bicycling.



Maximize economic competitiveness and return on investment by creating more attractive walkable and bikable communities and jobs through additional NCDOT, public, and private funding.



Advance environmental stewardship by reducing automobile dependence and connecting and protecting North Carolina's natural resources through a network of greenways.

Action steps for each of these goals can be found in Chapter 9 and Appendix 10-10.

WHO IS INVOLVED IN THE PLAN, AND WHAT IS THE PLANNING PROCESS?

The development of the 2013 *Statewide Pedestrian and Bicycle Plan* was a jointly funded effort by the North Carolina Department of Transportation (NCDOT), Department of Environment and Natural Resources (DENR), Department of Commerce, Department of Health and Human Services (DHHS), Blue Cross Blue Shield of North Carolina Foundation, and the Davis Wealth Management (DWM) Foundation. To ensure the planning process was comprehensive and representative, NCDOT assembled a Steering Committee and Advisory Committee of Division of Bicycle and Pedestrian Transportation staff, NCDOT divisions, MPO/RPO

staff, ped/bike advocacy groups, funding partners, and county and municipal representatives. Intradepartmental and interdepartmental efforts were instrumental in guiding the development of this plan and laid the foundation for future coordination.

The development of the final plan was a 12-month process informed by a robust public engagement process. The Steering Committee and Advisory Committee provided oversight and guided the development of the plan to completion. Plan development began with the Steering Committee Kick-Off meeting in July 2012. Regular meetings, workshops, and an ongoing communications and outreach effort all informed the plan's development.



- ◀ This plan required participation from multiple agencies, NCDOT staff, and the entire North Carolina community - every citizen counts.

Focus group meetings and regional public engagement workshops were held across the state in Fall 2012 to invite and incorporate input from diverse interest groups. These were followed by additional Steering Committee and Advisory Committee meetings leading to the development of the draft plan in January 2013. A second round of focus group meetings and stakeholder engagement took place

in February-March 2013. The final draft plan was developed in March 2013, with the final plan adopted in May 2013.

A complete list of Steering and Advisory Committee members is included in Acknowledgments. A detailed schematic of the planning project timeline can be seen below.



1

Public Engagement

Gathering public input from stakeholders across the state was central to developing a pedestrian and bicycle plan that is relevant to, and addresses the needs of, North Carolinians statewide. A variety of communications and engagement strategies were used to inform the public of the statewide plan and invite questions, comments, review, and other input. The goals of a multifaceted communications approach were to reach individuals and stakeholder groups of all areas of North Carolina, learn of their diverse walking and bicycling needs and desires, and use their input to formulate a vision, goals, and strategies for improving walking and bicycling conditions in North Carolina.

Communications outreach and public engagement strategies used throughout the development of the plan include:

- Steering Committee
- Focus group meetings
- Regional public engagement workshops
- Inter-/Intra-agency coordination
- Plan website
- Social media campaign
- Festivals and public/professional events outreach

A detailed listing of public meetings and workshops, outreach events, and communications materials can be found in Appendix 10-2.



- ◀ Visions, goals, and objectives were recorded at the Joint Steering and Advisory Committee Meeting held in July 2012. Input from the Committees, focus groups, and general public shaped the direction of this Plan.

WHAT DOES THE PLAN INCLUDE?

The *Statewide Pedestrian and Bicycle Plan* provides a review of walking and bicycling in North Carolina today, including the history of pedestrian and bicycle planning in North Carolina, relevant reports and surveys, current trends, people and processes involved in pedestrian and bicycle planning, and a review of current pedestrian and bicycle facilities around the state.

The plan also includes a guide for addressing statewide pedestrian and bicycle policy in North Carolina. This information, along with public input and the guidance of the Steering Committee, was used to inform the recommendations for North Carolina pedestrian infrastructure and bicycle infrastructure.


Chapters on NCDOT design standards and programming for health, safety, and active living provide a comprehensive guide on how pedestrian and bicycle planning can more specifically support the goals of safety, health, economics, mobility, and environmental stewardship. The implementation and tools for benchmarking and accountability sections then provide a blueprint of the steps and planning tools needed to monitor the plan's progress and turn its vision and goals into reality.

WHAT'S NEXT?

The 2013 *Statewide Pedestrian and Bicycle Plan* will serve as the guidance document for addressing pedestrian and bicycle transportation in North Carolina. The Plan will be implemented by NCDOT, with coordination and cooperation with DENR, DHHS, Department of Commerce, and other public and private agencies. Specifically, the NCDOT Division of Bicycle and Pedestrian Transportation (DBPT) will be a champion and leader in implementation.

This Plan and its resulting progress and projects will be evaluated to ensure efficiency, sustainability, and effectiveness. The Plan will make North Carolina a national leader for walking and bicycling.

ENDNOTES

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2 Walking & Biking In North Carolina Today



Fayetteville Street
Raleigh, NC

This chapter presents a short history of pedestrian and bicycle planning in North Carolina and an overview of existing walking and bicycling conditions. In many ways, North Carolina is ideally positioned to increase its walking and bicycling activity – seasonable weather for most of the year, dense street grid networks at the core of older towns and cities, and a long-standing state pedestrian and bicycle program provide the framework needed to foster safe walking and bicycling. In order to take advantage of these assets and improve the conditions for pedestrians and bicyclists, it is important to first review the progress that has been made and the opportunities and challenges that we face.

HISTORY OF PEDESTRIAN AND BICYCLE PLANNING IN NORTH CAROLINA (1974-2012)

NCDOT Division of Bicycle and Pedestrian Transportation

Bicycle planning formally began in North Carolina in 1974 with the passage of the Bicycle and Bikeway Act by the State General Assembly. With this legislation, the nation's oldest comprehensive state bicycle program was created. During the 1970s and 1980s the North Carolina Bicycle Program was responsible for achieving many milestones in bicycle planning in North Carolina, including the development of some of the state's first bicycle policies and infrastructure. The program also established the state Bicycle Highways system, mapping and signing bike routes across the state. In response to the 1991 Intermodal Surface Transportation Efficiency Act (ISTEA), the bicycle program was expanded to include pedestrian activities (1992). Today the bicycle and pedestrian program is known as the NCDOT Division of Bicycle and Pedestrian Transportation (DBPT) and is one of the largest such divisions in the country.

North Carolina's first statewide pedestrian and bicycle plan, *Bicycling and Walking in North Carolina: A Long-Range Transportation Plan*, was drafted and adopted in 1996. This plan established for the first time a set of long-range goals and objectives to improve walking and bicycling conditions in North Carolina. The vision and expectations put forward in the plan led to the development of new pedestrian and bicycle initiatives, including the

In this Chapter

History of Pedestrian and Bicycle Planning in North Carolina (1974-2012)

Planning for Walking and Bicycling in North Carolina

Walking and Bicycling in North Carolina: Impacts, Trends, and Issues Today

Mobility

Safety

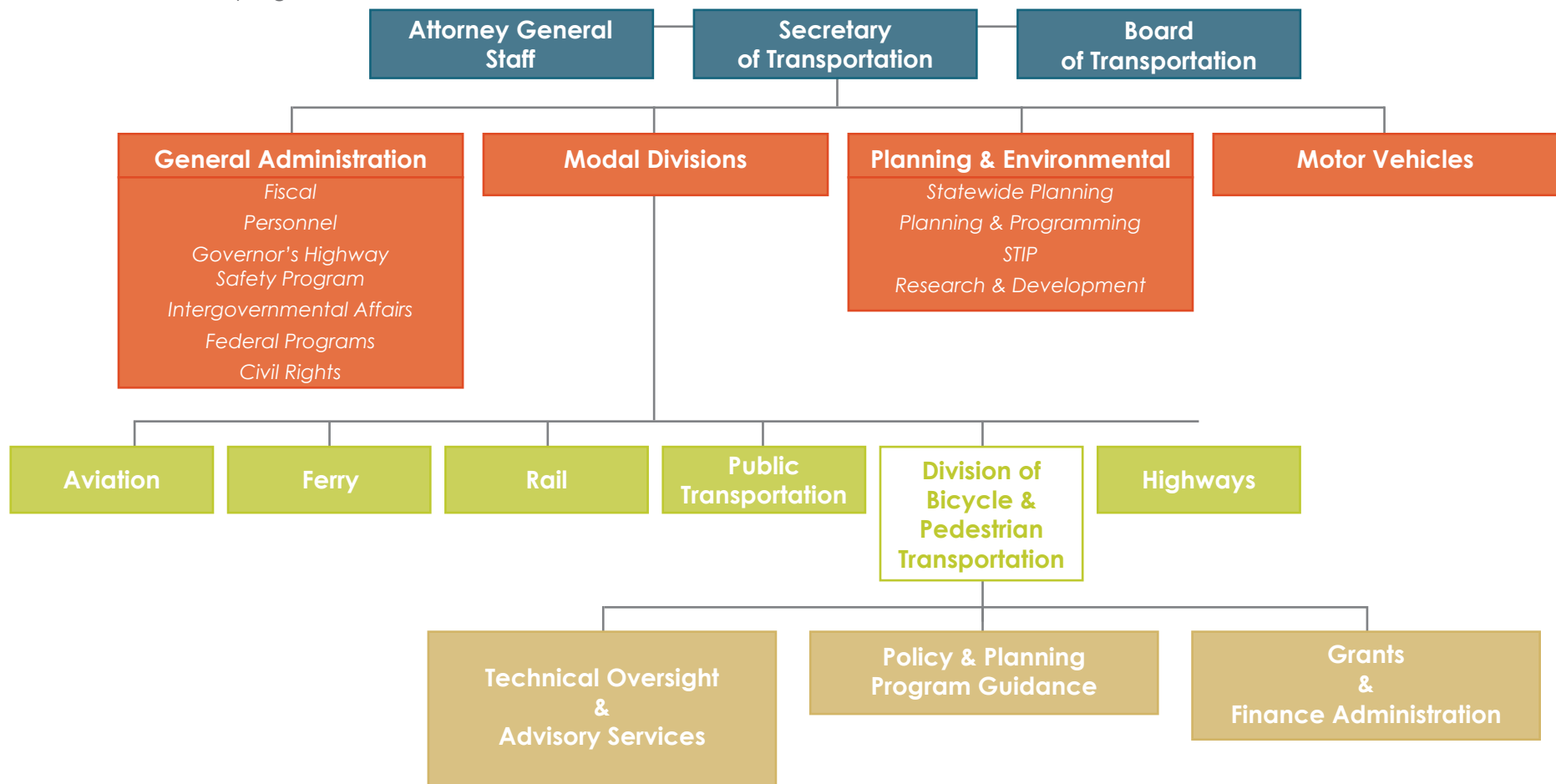
Health

Economics

Environment

1997 Walkable Communities Conference series, the annual Cycle North Carolina cross-state ride, the state's two Bicycle and Pedestrian Safety Summits (2000 and 2011), and the Bicycle and Pedestrian Planning Grant Initiative. Founded in 2004, the grant program addresses the need for local pedestrian and bicycle planning in North Carolina. Each year municipalities apply to receive matching funds for the development of comprehensive pedestrian and bicycle plans. Since its inception, 134 communities have been awarded a total of \$3.6 million in grant funds through the program.

This chart shows how the current Bicycle & Pedestrian Division fits into the structure of the State's Department of Transportation.



DBPT Milestones in Pedestrian & Bicycle Planning

Draft Comments: www.surveymonkey.com/s/WalkBikeNC_Draft

1929 Bicycle legally defined as vehicle by the NC General Assembly

1970s

1974 North Carolina Bicycle Program founded;

1975 Bicycling Highways system created

1979 NCDOT signs the first bicycle route

1980s

1981 The first state-funded bikeway is built

1984 NCDOT launches North Carolina's first statewide safety and education campaign, "Bicycles are Vehicles"

1985 NC Board of Transportation adopts first Bicycle TIP schedule.

1986 Effort launched to require bicycle safety education in schools

1987 DBPT developed the first state "Share the Road" sign and plaque. The design was adopted as a national standard for the MUTCD in the 1990s

1990s

1990 "Basics of Bicycling" curriculum created, implemented in schools

1992 The Governor's Highway Safety Program begins providing funding for safety programs through local law enforcement agencies

1993 NC Bicycle Facility Planning and Design Guidelines published and adopted

1996 Adoption of first statewide pedestrian and bicycle plan

1997 DBPT sponsors Walkable Communities Conference series

1999 Inaugural "Cycle North Carolina" cross-state ride

2000s

2000 DBPT calls North Carolina's first Bicycle and Pedestrian Safety Summit

2001 Passage of the Child Bicycle Safety Act, requiring persons under the age of 16 years to wear bicycle helmets.

2004 DBPT launches Bicycle and Pedestrian Planning Grant Initiative

2005 General Assembly approved the "Share the Road" license plate, which promotes bicycle safety awareness and raises funds for purchase of bicycle helmets for underprivileged children

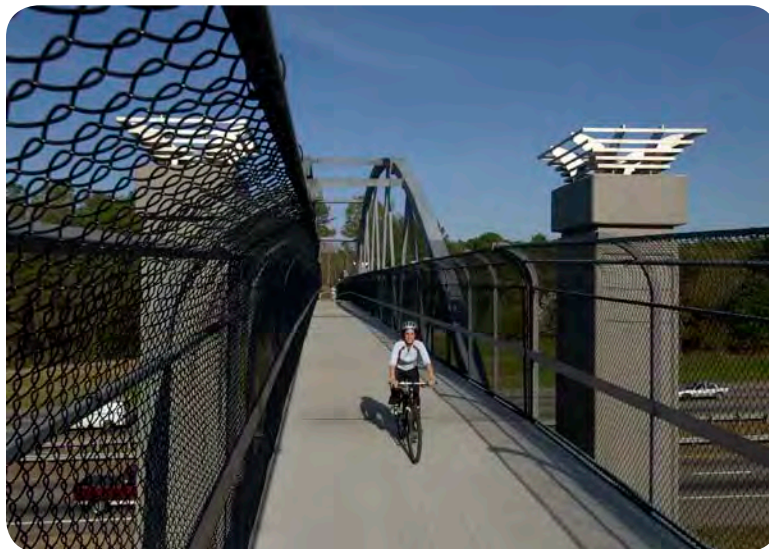
2012 DBPT pilots the State's first comprehensive pedestrian safety awareness campaign "Watch for Me NC"

2012 DBPT partnering sponsor for the inaugural Statewide Bike Summit



DBPT

The Division of Bicycle and Pedestrian Transportation is a comprehensive operation, guided by North's Carolina Complete Streets Policy, touching all aspects of multi-modal transportation with emphasis on issues and concerns related to bicycling and walking.



◀ The Reedy Creek Greenway, a DBPT engineering project, received the Environmental Excellence Award from FHWA and the City of Raleigh Appearance Award.

DBPT has led planning, engineering, and programmatic efforts since its inception. The Division sponsors workshops, trainings and conferences for Complete Streets Policy and Guidelines, fosters multi-modal planning, and integrates walking and bicycling into the ongoing activities of the Department of Transportation. DBPT has managed the design of hundreds of miles of multi-use paths in North Carolina and hundreds more state-level projects. The Division fosters a broad range of both pedestrian and bicycle safety initiatives including Safe Routes to School, educational programs, and media awareness campaigns.

DBPT Mission Statement:

To increase opportunities for active transportation and improve health, safety, welfare, and mobility of all by improving transportation corridors, the travel environment, and connecting people with places, with expanded support for communities and business through implementation of North Carolina Complete Streets Policy and Guidelines, thus promoting safety for all and decreasing bicyclist and pedestrian injuries and fatalities on North Carolina's streets, highways, and other public rights-of-way.



▲ In 2012, DBPT launched an awareness/education/enforcement pilot campaign in the Raleigh-Durham area. The effort included branding, messaging, distribution of bumper stickers, messaging on the backs of buses, and enforcement operations.

DBPT: Safe Routes to School Program

Safe Routes to School is an international movement that encourages and enables children to walk and bicycle to school. The federal SRTS program provides funds that can be used for "planning, design, and construction of infrastructure-related projects that will substantially improve the ability of students to walk and bicycle to school, on any public road or any bicycle or pedestrian pathway or trail within approximately 2 miles of a primary or middle school;" and funds can be used for "non-infrastructure related activities to encourage walking and bicycling to school, including public awareness campaigns and outreach to the press and various community leaders, traffic education and enforcement, student training, and funding for training, volunteers, and managers of SRTS programs." The federal SRTS program allows state, regional, and local agencies, as well as nonprofit organizations, to receive funds for SRTS activities.

North Carolina has received these funds to be used for projects that improve the transportation infrastructure around schools; reinforce appropriate behaviors of motorists, pedestrians, and bicyclists; and educate and encourage children to take advantage of walking and bicycling opportunities where it is safe to do so and where it is not safe; facilitate a project in order to make it safe. The purposes of the SRTS program are to:

- Enable and encourage children, to walk and bicycle to school
- Make bicycling and walking to school a safer and more appealing form of transportation, thus encouraging a healthy and active lifestyle from an early age
- Facilitate the planning, development, and implementation of projects and activities that will improve safety and

reduce traffic, fuel consumption, and air pollution in the vicinity of schools

Different types of reimbursable funding opportunities are available through this program which include:

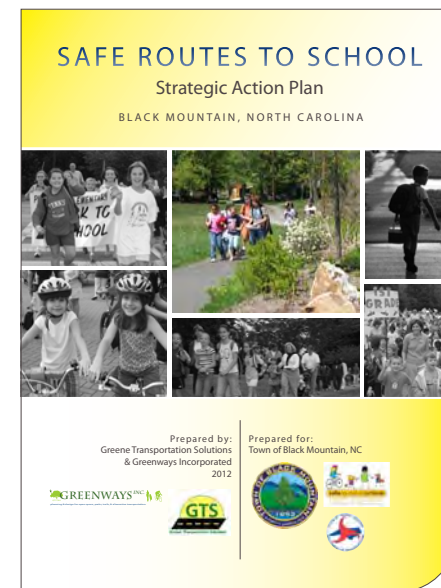
Action Plans or School Travel Plans:

These are plans to improve pedestrian and bicycle safety within a two-mile radius of schools that are grades K-8. The Action Plans provide a framework for identifying projects, programs, and activities that will make walking and bicycling to school safer and more appealing.

Non-Infrastructure Funds:

These funds are used for pedestrian and bicycle education, encouragement, evaluation, and enforcement. These grants are effective for developing programs that inspire children to walk and bike to school.

Infrastructure Funds: These funds are awarded for the planning, design, and construction of pedestrian and bicycle facilities within a 2-mile radius of a school. Funding requests typically range from \$100,000 to \$300,000 per project. Types of projects may include sidewalk, crossing, or on-street improvements, bike parking, and traffic calming.



▲ One of sixteen SRTS Action Plans completed in North Carolina



▲ The Brevard bike path is one of the SRTS infrastructure projects implemented around the state.

Highway Division Funds: These funds are allocated by each of NCDOT's 14 Highway Divisions and the SRTS office to fund infrastructure projects on state-maintained roadways. The projects must be within two miles of a school serving grades K-8 to be eligible. The funding amounts can be used to improve conditions for walking and biking to school.

2013 DHHS/NCDOT DBPT Partnership: This new program is an initiative with the Department of Health and Human Services (DHHS) in concert with the Community Transformation Grant (CTG). The State SRTS Coordinator will oversee ten SRTS local managers who, in turn, will oversee ten counties each to promote active living, reach more schools directly, and improve school siting policies among other things.

DBPT: Engineering (Project Development and Design)

Engineering has been a hallmark of the DBPT from its

inception. DBPT manages millions of dollars of pedestrian and bicycle projects across the State. Throughout its history, the DBPT has designed dozens of greenway projects and managed hundreds more.

Currently, DBPT engineering staff manages, administers, and reviews bicycle/pedestrian/greenway construction projects around the State. The Division participates in revising policies, guidelines, and manuals that impact pedestrian and bicycle accommodations; works to resolve complex pedestrian and bicycle design issues on major highway projects; and offers training and technical support to other DOT planning and design units as well as municipalities. In addition, engineering staff review all design plans from Divisions and provide expertise on Complete Streets projects and ADA issues.

DBPT oversees the implementation of TIP projects from the initial project prioritization all the way through to project construction. This includes:

- Define prioritization criteria and utilize a project prioritization methodology to rank projects.
- Work with municipalities to define projects and determine if design and preliminary engineering is needed; assist with feasibility study
- Work with municipalities to develop project design RFQs that follow FHWA/NCDOT guidelines
- Handle project design phase and invoicing.
- Review ROW, environmental, permitting documents
- Manages project from start to finish (Local Division monitors and administers construction)



▲ The Little Sugar Creek Greenway in Charlotte, NC is one of many projects funded and managed by the DBPT.

DBPT: Programs

DBPT understands that creating safe and inviting pedestrian and bicycle transportation systems requires attention to more than physical infrastructure; it also requires implementation of pedestrian and bicycle-related programs. Special attention is made by the DBPT for the development of targeted education, encouragement, enforcement, and evaluation strategies that improve North Carolina residents' health, safety, and their ability to incorporate walking and bicycling into everyday. Successful DBPT programs reach users and motorists in all different sectors of the population in North Carolina.

Specific funding is set aside for bicycle and pedestrian training workshops, safety research, projects and initiatives designed to meet needs statewide. Examples of successful programs initiated by the DBPT include:

- Bicycle Helmet Initiative
- “Watch For Me NC” Pedestrian Campaign
- County, Regional and Local Bicycle Maps
- Safety Educational Materials
- Let's Go NC - Bicycle and Pedestrian Curriculum
- Bicycle Rodeo Kit
- Crash Data Tool

DBPT: Planning

The DBPT is a national leader in the breadth and depth of pedestrian and bicycle planning achieved across North Carolina. In 2004, to encourage the development of comprehensive municipal-level bicycle plans and pedestrian plans, DBPT in partnership with NCDOT's Transportation Planning Branch (TPB) created a matching grant program to fund plan development. To-date, a total of \$3.6 million has been allocated to 135 municipalities through this grant program (See pages 2-16 through 2-18 for more detailed information). The Planning Grant Initiative won an FHWA Transportation Planning Excellence Award in 2010.

The Division of Bicycle and Pedestrian Transportation expanded its municipal planning grant program in 2009, to include grants to councils of government for comprehensive regional bicycle plans. Funding had been set aside by the legislature in 2007 to begin this program. “The Regional Bicycle Planning Initiative” provides money and technical assistance to develop on-road and off-road bicycle connections between municipal jurisdictions and through scenic natural areas within a defined region. These connections identify improvements to existing roadways and may also locate preferred alignments through public lands or new developments for greenways and rail trails. These comprehensive planning documents aim to create

a safe bicycle system between origins and destinations of interest within a county or multi-county region. The goals of this planning initiative are to:

- identify an integrated system of on-road and off-road trail connectivity that is safe and pleasant to use
- encourage regional coordination of bicycle improvements that enhance bicyclist access, mobility and safety
- put forward creative solutions that overcome physical and political barriers to implementation of projects and programs
- promote policies and guidelines that assure the integration of bicycle accommodations in state, regional and local highway and bridge projects; infrastructure improvements on public lands, such as state and national park and forest lands; and private development projects
- identify project and program recommendations that are realistic, well-informed and implementable
- contribute to local economic development in regions throughout the state

DBPT determines pedestrian and bicycle project prioritization. This data-driven approach places projects in priority order, based on various criteria including how the project meets NCDOT's goals. The strategic prioritization process occurring every two years serves as the primary input source for the developmental STIP (years 6 to 10) and the 10-year Program & Resource Plan.



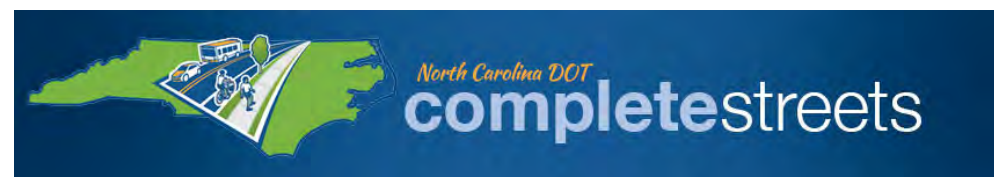
Left: Programs in which DBPT plays a significant role.

Top Right: "Share the Road" license plates fund the Bicycle Helmet Initiative.

Top Left: The Guide to North Carolina Bicycle and Pedestrian Laws is a convenient brochure for law enforcement, pedestrians, bicyclists, and motorists.

Center: The Safe Routes to School program is explained in detail on previous pages.

Bottom: The DBPT will lead Complete Streets training across North Carolina in 2013.



PLANNING FOR WALKING AND BICYCLING IN NORTH CAROLINA

Pedestrian and bicycle planning is carried out on several different scales in North Carolina by a range of agencies, departments, and special interest groups. This section provides an overview of plans, reports, and maps relevant to walking and bicycling in North Carolina and the stakeholders that contribute to these efforts.

Statewide Planning

NCDOT, Bicycling & Walking in North Carolina: A Long-Range Transportation Plan, 1996

The 1996 statewide pedestrian and bicycle plan was the first of its kind in North Carolina. The plan developed five goals to guide NCDOT's efforts to improve conditions for walking and bicycling:

1. Provide the bicycle and pedestrian facilities necessary to support the mobility needs and economic vitality of communities throughout North Carolina.
2. Provide a comprehensive program of education and enforcement strategies that will improve the safety of all bicyclists and pedestrians.
3. Institutionalize walking and bicycle considerations to enhance current transportation practices at the state, regional, county, and local level.
4. Identify and promote new and innovative ways to advance bicycle and pedestrian safety and enjoyment through research and needs assessment.
5. Encourage walking and bicycling as viable transportation options.

NCDOT, From Policy to Projects, 2040 Plan: North Carolina Statewide Transportation Plan, 2012

The 2040 North Carolina Statewide Transportation Plan provides a blueprint for how North Carolina's transportation system should develop over the next 30 years to meet the needs of its users. The plan reaffirms 5 goals for the future of NCDOT and the transportation network:

1. Make our transportation network safer
2. Make our transportation network move people and goods more efficiently
3. Make our infrastructure last longer
4. Make our organization a place that works well
5. Make our organization a great place to work

The plan also reviews the current conditions for each mode of transportation, according to Level of Service (LOS) standards (as defined by NCDOT, level of service is the "quality of service from the perspective of the user" and can vary from a "desired state" of LOS A to a failing state of LOS F). Bicycle and pedestrian performance is reported to be at LOS D. The plan states that the greatest priority for pedestrian and bicycle improvements is addressing walking and bicycling safety needs. Based on NCDOT estimates, the 30-year investment needs for pedestrian and bicycle improvements total \$1.29 billion to achieve LOS A. Current deficiencies in the pedestrian and bicycle network account for \$1.05 billion, or 81%, of 30-year needs.

NCDOT, North Carolina's Strategic Highway Safety Plan, 2007

The *Strategic Highway Safety Plan* outlines several strategies for improving pedestrian and bicycle safety on North Carolina highways. These include:

- Revising the DMV Drivers Handbook to include more information and test questions on how

to share the road with bicyclists and crossing pedestrians

- The rights and responsibilities of different road users
- Training law enforcement on bicycle and pedestrian laws and local law enforcement efforts to improve walking and bicycling safety
- Stronger penalties for violating directions/directives of school crossing guards
- Establishing a central governing body for driver education in North Carolina

NCDOT, Complete Streets Planning and Design Guidelines, 2012

NCDOT released its complete streets guidelines in 2012 following the adoption of a Complete Streets Policy in 2009. This document includes recommendations to accommodate all users of the transportation network, including pedestrians and bicyclists. The process of planning and designing complete streets, as well as guidelines for implementing the policy, are addressed. NCDOT is currently conducting complete streets training throughout the state to help regional, county, and local planners, engineers, and designers incorporate these guidelines into their projects and programs.

Division of Parks and Recreation, NC Department of Environment and Natural Resources, 2009-2013 North Carolina Statewide Comprehensive Outdoor Recreation Plan, 2008

The *Statewide Comprehensive Outdoor Recreation Plan* (SCORP) is North Carolina's five-year policy plan for outdoor recreation and provides guidance for the Land and Water Conservation Fund (LWCF) program and for other state-administered grant programs. The primary state agencies involved in the SCORP implementation include the Division

of Coastal Management, Division of Water Quality, Division of Parks and Recreation, Division of Forest Resources, and the Wildlife Resources Commission.

The SCORP includes a listing of the top 20 outdoor activities by percent of state residents who participate:

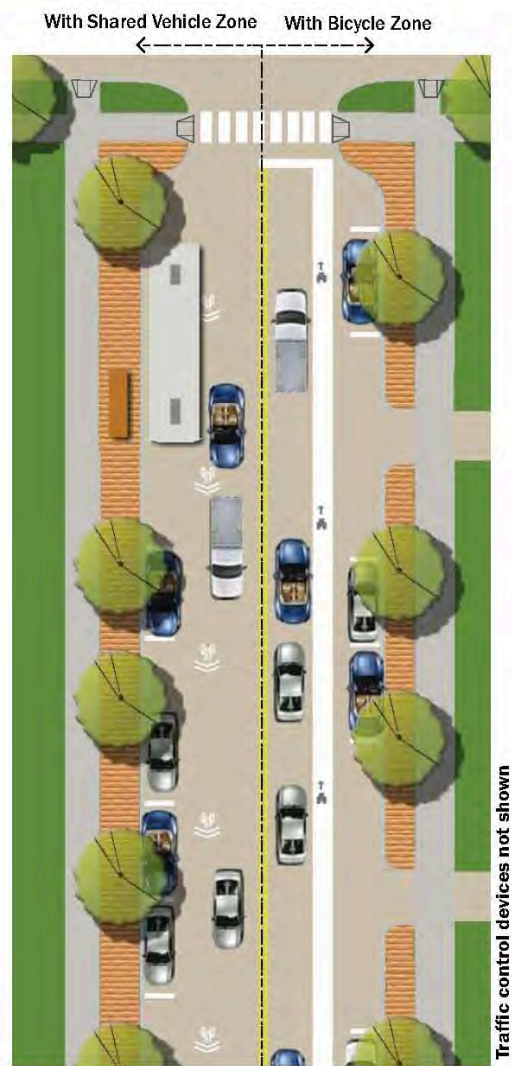
1. Walk for pleasure (82%)
2. Family gathering (74.6%)
3. Gardening or landscaping (65.4%)
4. Driving for pleasure (58.2%)
5. View/photo natural scenery (57%)
6. Visit nature centers, etc. (52.9%)
7. Sightseeing (52.9%)
8. Picnicking (50%)
9. Attend sports events (48.6%)
10. Visit a beach (44.2%)
11. Bicycling (31%)

Other statewide and county trends from the SCORP that reflect conditions in North Carolina or impact local priorities include:

- The number of North Carolinians participating in recreational activities has increased by nearly 50 percent in the past decade, from 27.4 million to 40.5 million participants
- Between 1995 and 2006, participation in every outdoor recreation activity increased in North Carolina except for team sports (-1.5 percent change, 21.6 percent participating). The highest percentage increase of participants occurred in outdoor adventure activities (87.5 percent change, 51.2 percent participating).

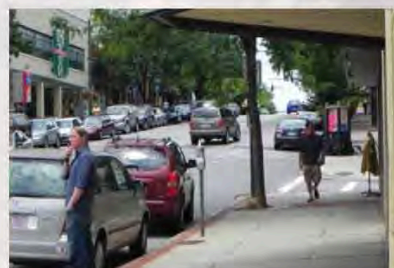
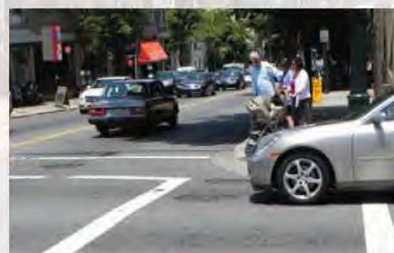
URBAN/SUBURBAN MAIN STREET

PLAN VIEW



KEY ELEMENTS

- May function as an arterial, collector or local street. May function as a collector serving as a primary thoroughfare for traffic circulation in a limited area. May function as a local street for an outlying business district.
- Designed to carry vehicles at low speeds.
- A destination street for a city or town, serving as a center of civic, social and commercial activity.
- Serves substantial pedestrian traffic as well as transit and bicycles.
- Characterized by wide sidewalks, crosswalks and pedestrian amenities, due to emphasis on pedestrian travel.
- Bicycle lanes are allowed but typically not necessary on these streets due to lower speeds and volumes and the desire to keep pedestrian crossing distances to a minimum.



STREET CROSS-SECTION ZONES

- Sidewalk Zone:** The pedestrian walk area is of sufficient width to allow pedestrians to walk safely and comfortably. Pedestrians are the priority on a main street.
- Green Zone:** Consists of the area between the sidewalk zone and curb. Includes street trees and other landscaping, as well as interspersed street furnishings and pedestrian-scale lighting in a hardscaped amenity zone.
- Parking/Transit Zone:** Accommodates on-street parking and transit stops. Width and layout may vary.
- Bicycle Zone:** A zone for bicyclists separate from vehicular traffic.
- Motor Vehicle / Shared Vehicle Zone:** The primary travel way for vehicles. A shared vehicle zone has mixed traffic (cars, trucks, buses and bicycles).
- Development Zone:** Development should be pedestrian-oriented with narrow setbacks and an active street environment.

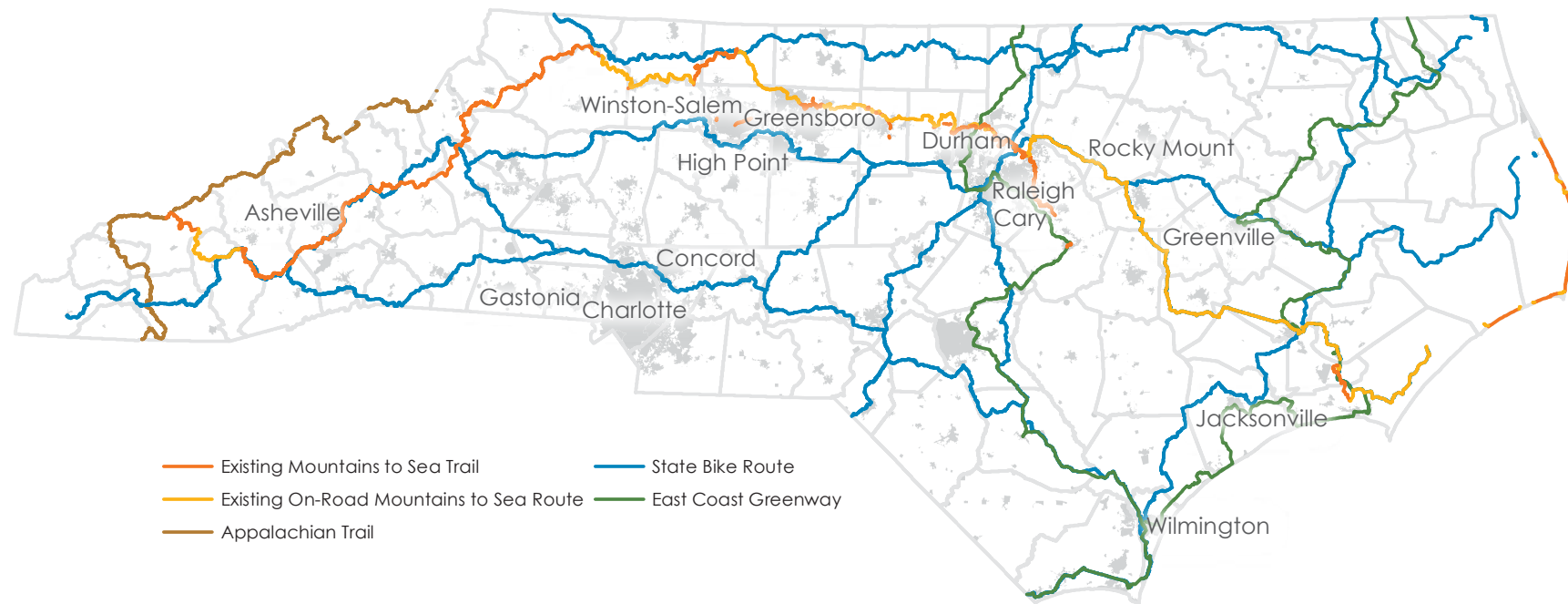
◀ Page image from the NCDOT Design Guidelines for Complete Streets. This document provides detailed plan views and sections to illustrate the spatial relationship between elements of various street types.

Statewide Bicycle Routes and Major Trail Systems

North Carolina Bicycle Route System

One of the first of its kind in the country, North Carolina's bicycle route system was developed in response to the 1974 Bicycle and Bikeway Act. The bicycle route system identifies roads across North Carolina that are safer for bicycling, and links them to a network of bicycling highways that provide access to major population centers of the state, state

parks, historic sites, and other points of interest. The current network consists of nine different routes covering 2,400 road miles. The 712-mile Mountains to Sea route is the main artery of the system, extending east-west and connecting to most of the system's routes. Bicycle tourists use regional and route-specific maps to navigate the state.



Existing North Carolina Bicycle Routes and statewide trail systems. There are nine routes encompassing 3,000 miles.

Statewide Trails

MOUNTAINS TO SEA TRAIL

The Mountains to Sea Trail is part of the North Carolina State Park Trails Program and is managed by a number of partners across the state, including the Friends of the Mountains to Sea Trail. This 1,000-mile-long hiking route extends from the Great Smoky Mountains in western North Carolina to the Outer Banks on the coast. It connects several cities, towns, and state and national parks and forests. The entire length of the trail has been completed by long-distance backpackers and runners, but shorter portions are regularly used for day hikes, trail running, and recreation events.

(http://www.ncparks.gov/About/trails_mst.php)

(<http://www.ncmst.org/>)



East Coast



Greenway

EAST COAST GREENWAY

The East Coast Greenway (ECG) is a developing multi-state trail system that extends almost 3,000 miles from Florida to Maine. At completion, the greenway will connect all major cities of the eastern seaboard by off-road paths. As of 2012 over 25% of the greenway is complete. The 360-mile North Carolina portion of the ECG travels through the eastern part of the state, with the current route connecting Durham, Raleigh, Fayetteville, and Wilmington. Approximately 18% of North Carolina's off-road route has been constructed.

(<http://www.greenway.org/nc.aspx>)

Regional Trails

NEUSE RIVER GREENWAY

Part of the Mountains to Sea Trail, the Neuse River Greenway runs 33 miles from the base of Falls Lake Dam, through Raleigh and connecting to Clayton in Johnston County. The greenway is 33 miles in length making it the longest, continuous paved greenway in the state as of 2013. Plans are actively underway to extend the paved section of the trail east to the coast and west to the mountains. The greenway requires no street crossings.

CAROLINA THREAD TRAIL

The Carolina Thread Trail is a planned regional trail network that spans 15 counties in western North Carolina and South Carolina. As of 2012, 100 miles of the trail are open for use and 14 corridors are being developed. County-level greenway plans have been completed for all 15 participating counties. These plans include recommendations for on-road walkways and bikeways in addition to off-street greenways and blueways. The CTT is a model project for regional trail planning coordination between local communities and partner organizations.

(<http://www.carolinathreadtrail.org>)

AMERICAN TOBACCO TRAIL

The American Tobacco Trail (ATT) is a rail-trail that extends from western Wake County north to downtown Durham. With the 2013 addition of a pedestrian and bicycle bridge over Interstate 40, the trail stretches a total of 22 miles. The ATT has been incorporated as part of the North Carolina segment of the East Coast Greenway.



**CAROLINA
THREAD
TRAIL**

*Weaving
Communities
Together*



Regional Bicycle and Pedestrian Planning

Metropolitan areas and smaller urban areas encompass multiple cities and towns and often extend across county lines. As North Carolina's population continues to grow and urbanize, regional planning for walking and bicycling will become increasingly important, particularly for integration with transit and key destinations. Identifying helpful connections, setting design standards, and collaborating on planning initiatives across departments and levels of government will all be important for providing cohesive regional pedestrian and bicycle planning networks across North Carolina.

MPO and RPO Plans

Metropolitan Planning Organizations (MPOs) and Rural Planning Organizations (RPOs) are responsible for regional transportation planning in North Carolina. These regional planning bodies have jurisdictions that span across multiple counties and parts of counties, making cross-county and municipal coordination crucial for successful planning.

Some North Carolina MPOs and RPOs have stand-alone pedestrian and bicycle plans, including those listed below.

Locality	Date	Type	Plan
CAMPO (Capital Area MPO)	2003	MPO	Bike/Ped
Durham-Chapel Hill-Carrboro MPO	1993	MPO	Bike
Fayetteville MPO	2009	MPO	Bike/Ped
Greensboro	2006	MPO	Bike/Ped
Greenville Urban Area	2011	MPO	Bike/Ped
Jacksonville	2008	MPO	Bike/Ped
Wilmington Area	1981	MPO	Bike
Winston-Salem Urban Area	2005	MPO	Bike
Winston-Salem Urban Area	2007	MPO	Ped
Lake Norman	2006	RPO	Bike
Mid-Carolina RPO	2005	RPO	Bike/Ped

Other MPOs and RPOs have incorporated bicycle and pedestrian plans into their Long-Range Transportation Planning (LRTP) documents or do not have a plan, but have interspersed pedestrian and bicycle elements within the LRTP.

County Plans

The following NC counties have completed stand-alone pedestrian and/or bicycle plans:

Locality	Date	Plan
Alamance County	1994	Bike/Ped
Caldwell County	2004	Bike/Ped
Chatham County	2011	Bike
Forsyth County	1988	Bike
Haywood County	2011	Bike
Mecklenburg County	1977	Bike
Orange County	1999	Bike

Other Regional Plans

Many regional planning efforts have occurred or are occurring around the State to promote regional connectivity.

Regional plans include:

- Croatan Regional Bike Plan
- High Country Regional Bike Plan
- Kerr-Tar Lakes District Regional Bike Plan
- Lake Norman Regional Bike Plan
- CORE Pedestrian-Bicycle-Greenspace Plan
- Blue Ridge Bike Plan
- Albemarle Regional Bike Plan
- Central Park Regional Bike Plan

Local Pedestrian and Bicycle Planning

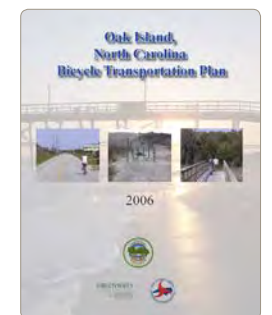
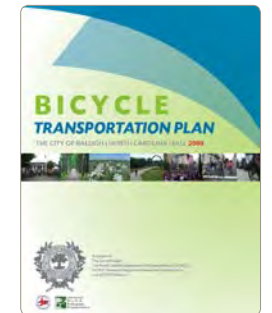
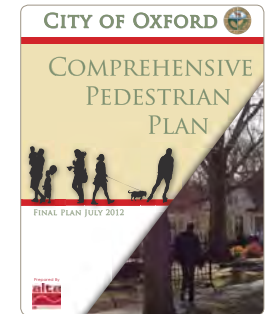
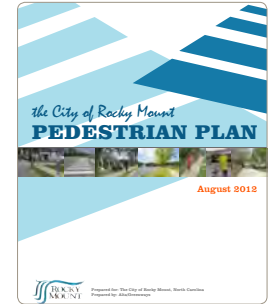
Over 125 municipalities in North Carolina have completed pedestrian and bicycle plans, more than 80 percent of which were funded in part by DBPT's Planning Grant Initiative. Following is a list of municipalities with completed pedestrian and/or bicycle plans. The adoption year of the most recent plan for each municipality is listed.

Locality	Date	Bike/Ped	NCDOT Grant
Aberdeen	2011	Ped	X
Ahoskie	2010	Bike	X
Albemarle	2010	Bike	X
Albemarle	2007	Ped	X
Asheboro	2008	Ped	X
Asheville	2008	Bike	X
Asheville	2004	Ped	
Badin	2008	Ped	X
Banner Elk	2009	Ped	X
Beaufort	2009	Bike	X
Belmont	2009	Ped	X
Belmont	2013	Bike	X
Bessemer City	2010	Ped	X
Biscoe	2010	Ped	X
Black Mountain	2008	Ped	X
Boiling Springs	2006	Ped	X
Boone	2012	Ped	X
Boone	1995	Bike/Ped	
Brevard	2006	Ped	X
Bryson City	2007	Ped	X
Burnsville	2006	Ped	X
Burlington	2013	Ped	
Butner	2010	Ped	X
Carolina Beach	2011	Bike	X
Carrboro	2009	Bike	X
Cary	2007	Ped	X
Chapel Hill	2005	Bike/Ped	

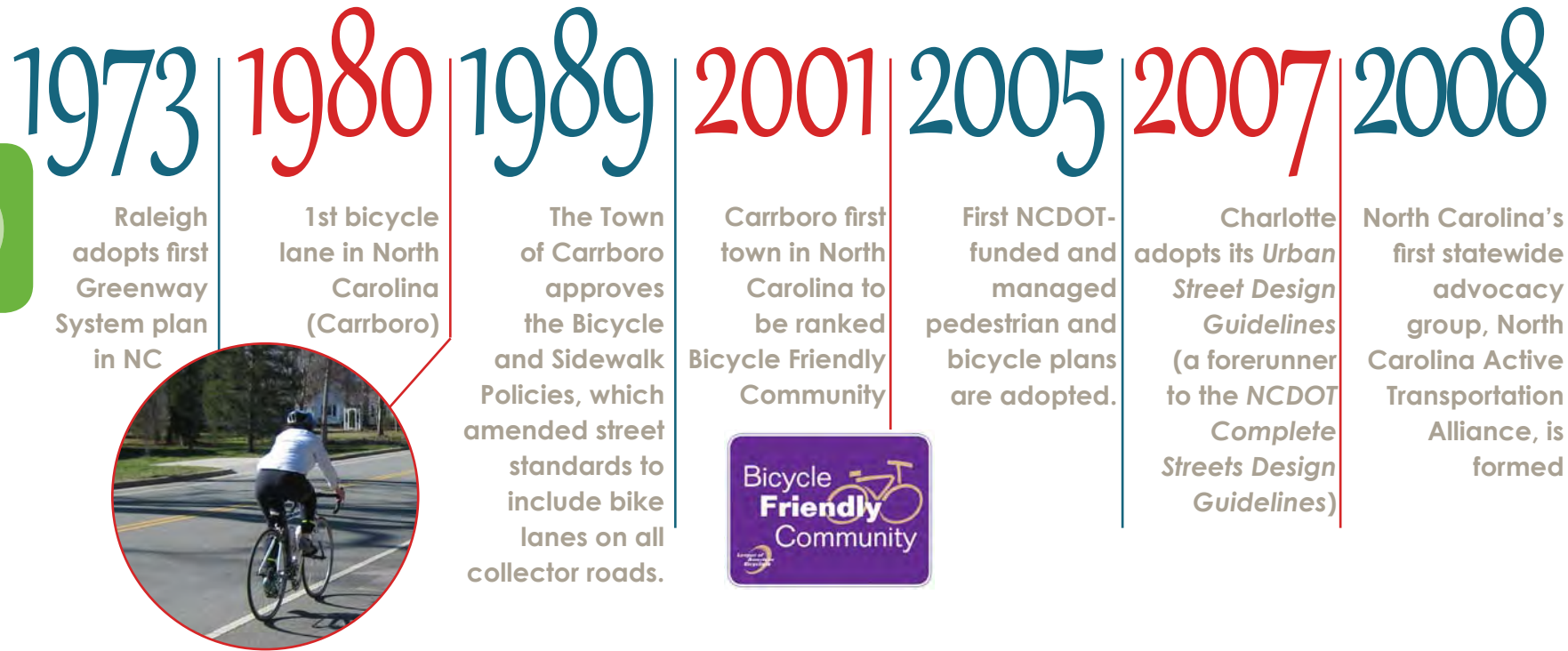
Locality	Date	Bike/Ped	NCDOT Grant
Charlotte	2008	Bike	X
Cherryville	2009	Ped	X
Clayton	2006	Bike	X
Clinton	2012	Ped	X
Columbia	2010	Ped	X
Conover	2008	Ped	X
Cornelius	2012	Ped	X
Cramerton	2008	Ped	X
Creedmoor	2012	Ped	X
Creedmoor	2012	Bike	X
Davidson	2008	Bike	X
Dunn	2008	Ped	X
Durham	2006	Bike	
Durham	2006	Ped	X
Eastern Band of Cherokee Indians	2009	Ped	X
Eden	2010	Ped	X
Edenton	2009	Ped	X
Elizabeth City	1985	Bike	
Elon	2008	Bike/Ped	
Fayetteville	1980	Bike	
Goldsboro	1999	Bike/Ped	
Graham	2006	Ped	X
Granite Falls	2011	Ped	X
Grifton	2008	Ped	X
Hendersonville	2007	Ped	X
Hertford	2007	Ped	X
Hickory	2005	Bike/Ped	
Hildebran	2010	Ped	X
Hillsborough	2009	Bike/Ped	
Holly Springs	2012	Bike	X
Holly Springs	2007	Ped	X
Indian Trail	2011	Bike	X
Indian Trail	2009	Ped	X

Locality	Date	Bike/Ped	NCDOT Grant
Jamestown	2010	Ped	X
Jefferson	2008	Ped	X
Kannapolis	2007	Ped	X
Kenansville	2007	Ped	X
Kernersville	2007	Bike/Ped	
Kings Mountain	2011	Bike	X
Kings Mountain	2002	Bike/Ped	
Kinston	2008	Ped	X
Leland	2008	Bike	X
Locust	2009	Ped	X
Mars Hill	2007	Ped	X
Marshville	2010	Ped	X
Matthews	2006	Bike	X
Mint Hill	2011	Ped	X
Mooresville	2008	Bike	X
Mooresville	2006	Ped	X
Morehead City	2011	Ped	X
Morehead City	2007	Bike	X
Nashville	2008	Ped	X
New Bern	2006	Bike	X
New Bern	2009	Ped	X
North Topsail Beach	2006	Bike	X
North Wilkesboro	2009	Ped	X
Norwood	2007	Ped	X
Oak Island	2006	Bike	X
Old Fort	2010	Ped	X
Oxford	2012	Ped	X
Oxford	2013	Bike	X
Pembroke	2010	Ped	X
Pine Knoll Shores	2008	Ped	X
Pittsboro	2009	Ped	X
Raleigh	2009	Bike	X
Roanoke Rapids	2011	Ped	
Rocky Mount	2007	Bike	X

Locality	Date	Bike/Ped	NCDOT Grant
Rocky Mount	2012	Ped	
Roxboro	2008	Ped	X
Salisbury	2009	Bike	X
Sanford	2010	Ped	X
Sanford	2012	Bike	X
Shelby	2007	Ped	X
Southern Pines	2010	Bike	X
Sparta	2006	Ped	X
Stallings	2008	Ped	X
Swansboro	2011	Bike	X
Sylva	2011	Ped	X
Tarboro	2006	Bike	X
Thomasville	2009	Bike	X
Troutman	2008	Ped	X
Wake Forest	2008	Bike	X
Wake Forest	2006	Ped	X
Washington	2013	Bike	X
Washington	2006	Ped	X
Waynesville	2010	Ped	X
Waxhaw	2012	Ped	X
West Jefferson	2011	Ped	X
White Lake	2010	Ped	X
Williamston	2012	Ped	X
Wilkesboro	2007	Ped	X
Wilmington	2009	Ped	X
Wilson	2008	Bike	X
Wilson	2006	Ped	
Winston-Salem	2005	Bike	
Winston-Salem	2007	Ped	
Winterville	2009	Ped	X
Wrightsville Beach	2005	Bike	
Yadkinville	2010	Ped	X
Yanceyville	2012	Ped	X



TIMELINE OF MAJOR LOCAL ACCOMPLISHMENTS



Bicycle
Friendly
Community

CASE STUDY



Charlotte Pedestrian and Bicycle Achievements

At the request of local bicycle advocates, the City of Charlotte, NCDOT, and the Mecklenburg-Union MPO funded a bicycle plan and a bicycle suitability map for the Charlotte area in 1999. While bicycle plans had been completed for Charlotte in prior decades, none had ever been accompanied by an implementation commitment. The City of Charlotte also committed to establish a

standing Bicycle Advisory Committee and initiate and fund a Bicycle Program within the Charlotte Department of Transportation to the tune of \$500,000 per year. The City also committed to hire the state's first municipal bicycle program manager, a position that has been in place since the year 2000. The staff position and the funding continue to be supported by the City. Since 2000, the City has overseen the installation of more than **117 miles of bicycle lanes** and on-street

bike routes, **36 miles of off-street paths**, and released a second edition of its bicycle map, in addition to numerous programs and events to encourage bicycling. The City has also seen **bike-rack-on-bus usage increase from 19,000 to nearly 90,000 trips per year** since 2001.

The City has also hired a Pedestrian Program Manager to manage its \$7.5 million per year Pedestrian Program, a program which funding has more than tripled since the

2010 2011 2012 2012 2012 2012 2012

Wilmington creates first bicycle boulevard in the State



Davidson and Cary become two of the first ten Walk Friendly Communities in the United States.

Asheville becomes 10th Bicycle Friendly Community in North Carolina



Durham launches state's first bike and hike map for mobile devices

North Carolina holds first statewide Bicycle Summit



Charlotte creates state's first bike share program & first 'bike box'

Raleigh completes 99 miles of greenways, creating the largest system of greenways in the state

year 2000. The City is developing a "Walkability Strategy" and is working on a Pedestrian Safety Action Plan. In all, the City has more than three full-time staff dedicated exclusively to pedestrian and bicycle programs.

During the last ten years, Charlotte has developed a nationally renowned Complete Streets policy and program known as *The Urban Streets Design Guidelines*. In addition to its bicycle and pedestrian programs, the City funds the implementation of bicycle and

pedestrian infrastructure in all of its streets projects based on the process and criteria in the USDGs. Recognized as one of the national best practice design standards for walking and bicycle projects, the USDGs include methodologies for measuring bicycle and pedestrian levels of service at intersections and determining the appropriate walkway and bikeway types based on the type of street and its transportation purpose and land use context. The USDGs have since been incorporated into the City and County's design

standards for new development and are one of the base documents for development of the NCDOT Complete Streets Design Guidelines. Another notable accomplishment is the implementation of over 20 road diets, which have led to increased walking, bicycling, and roadway safety.

At the county level, the Department of Parks & Recreation's more than 30-year old greenway program has completed miles of urban greenways and hired its first Safe Routes to School coordinator. The

County also continues to have staff dedicated to greenway planning and development, although the number of staff in this role has decreased significantly in recent years due to local funding cuts.

Finally, in the summer of 2012, Charlotte Center City Partners, in cooperation with the City of Charlotte and Blue Cross Blue Shield of North Carolina, launched the Carolina's first large-scale urban bike share program with 200 bikes and 20 stations around downtown Charlotte.

Walk- and Bicycle-Friendly Communities, Universities, and Businesses

The Walk Friendly Communities program provides national recognition to places that support safe walking environments, support access to destinations by foot, and integrate pedestrian facilities into the transportation network. The program is operated by the Pedestrian and Bicycle Information Center of the University of North Carolina Highway Safety Research Center and is sponsored by the U.S. Department of Transportation Federal Highway Administration and FedEx.

The Bicycle Friendly America program recognizes communities, universities, and businesses that provide safe bicycling environments and encourage bicycling through projects, programs, and other efforts. The program is run by the League of American Bicyclists.

Below is a listing of North Carolina communities, universities, and businesses that were rated as walk- or bike-friendly.



Bicycle Friendly Communities	
Name	Ranking
Asheville	Bronze
Carrboro	Silver
Cary	Bronze
Chapel Hill	Bronze
Asheville	Bronze
Carrboro	Silver
Cary	Bronze
Chapel Hill	Bronze
Charlotte	Bronze
Davidson	Bronze
Durham	Bronze
Greensboro	Bronze
Raleigh	Bronze
Wilmington	Bronze



Walk Friendly Communities

Name	Ranking
Cary	Bronze
Charlotte	Bronze
Davidson	Bronze



Bicycle Friendly Universities

Name	Ranking
Duke University	Bronze
North Carolina State University	Bronze
University of North Carolina, Greensboro	Bronze
University of North Carolina, Wilmington	Bronze

Bicycle Friendly Businesses

Name	Ranking
City of Durham	Silver
Liberty Bicycles	Silver
Schuler Funeral Home	Bronze
National Institute of Environmental Health Sciences	Bronze
Town of Chapel Hill	Bronze
URS Corporation Morrisville	Bronze

Many Carrboro roads feature bicycle lanes. Carrboro has earned the highest designation in North Carolina of Silver Bicycle Friendly Community as of 2013.



In 2012, Rocky Mount invested in streetscape improvements, making Main Street more attractive and pedestrian-friendly.



Wilmington, one of North Carolina's Bicycle Friendly Communities, features North Carolina's first bike boulevard, (a low-volume roadway providing preferential treatment for bicyclists) on Ann Street (part of the River to the Sea Bikeway).



▲ Above is a “bicycle rodeo” in Holly Springs, North Carolina sponsored by the Police Department and assisted by volunteers. With so many advocacy groups in North Carolina, it’s easy to find ways to stay involved and help advance the future of bicycling for our children.

Pedestrian and Bicycle Organizations

Committees and Commissions

Some regional planning organizations and municipalities in North Carolina have established pedestrian and bicycle advisory groups to provide recommendations to decision-makers regarding walking and bicycling issues. These committees and commissions are typically made up of citizens, bicycle and pedestrian advocates, planners, and/or local staff who are interested in pedestrian and bicycle issues in their locality. The following are a list of examples and may not be inclusive of all organizations:

- Asheville Bicycle & Pedestrian Task Force
- CAMPO Bicycle & Pedestrian Stakeholders Group
- Chapel Hill Bicycle & Pedestrian Advisory Board
- City of Charlotte Bicycle Advisory Committee
- Durham Bicycle and Pedestrian Advisory Commission
- Emerald Isle Bicycle and Pedestrian Advisory Committee
- French Broad River MPO Complete Streets Subcommittee
- Greenville Bicycle and Pedestrian Commission
- Kernersville Pedestrian and Bicycle Advisory Committee
- Mecklenburg County Greenway Advisory Committee
- Raleigh Bicycle and Pedestrian Advisory Commission
- Southern Pines Bicycle and Pedestrian Advisory Committee
- Wilmington MPO Bicycle & Pedestrian Advisory Committee
- Wilson Bicycle and Pedestrian Advisory Board
- Winston-Salem Bicycle Advisory Committee

Pedestrian and Bicycle Advocacy Organizations

Bicycle and pedestrian advocacy organizations exist in cities across North Carolina. Some of these operate primarily on a local level, while others take a more regional or statewide approach in their advocacy efforts. Active advocacy groups in North Carolina include:

- North Carolina Active Transportation Alliance (NCATA)
- Bicycling in Greensboro (BIG)
- Charlotte Area Bicycle Alliance
- Carrboro Bicycle Coalition (CBC)
- Durham Bicycle Coalition
- Asheville on Bikes
- Bicycle HaywoodNC
- Connect Gaston

North Carolina is also home to a number of clubs for on-road and off-road walkers, cyclists, mountain bikers, runners, and hikers. While these groups typically have a recreational focus, many are also involved in advocacy efforts, volunteer activities such as trail maintenance, and planning and sponsoring rides, skills courses, and other events. Formally and informally they help to raise awareness about walking, running, and cycling in North Carolina.

WALKING AND BICYCLING IN NORTH CAROLINA: IMPACTS, TRENDS, AND ISSUES TODAY

The State of North Carolina, its agencies, MPOs/RPOs, counties, municipalities, stakeholders, and citizens have improved walkability and bikability through effective planning, facility development, and advocacy as described in the first half of this chapter. The second half of this chapter addresses the current impacts, trends, issues, and challenges related to walking and bicycling in North Carolina. These are expressed through the “lens” of the five pillars described in Chapter 1 (Mobility, safety, health, economics, and environment).

The five pillars directly address the NCDOT mission statement:

Connecting people and places safely and efficiently, with accountability and environmental sensitivity to enhance the economy, health and well-being of North Carolina.

Ultimately, the existing conditions described will inform the Plan's recommendations for policies, infrastructure, programs, inter- and intra-agency coordination, and implementation with the goal of accomplishing the transportation mission of NCDOT.

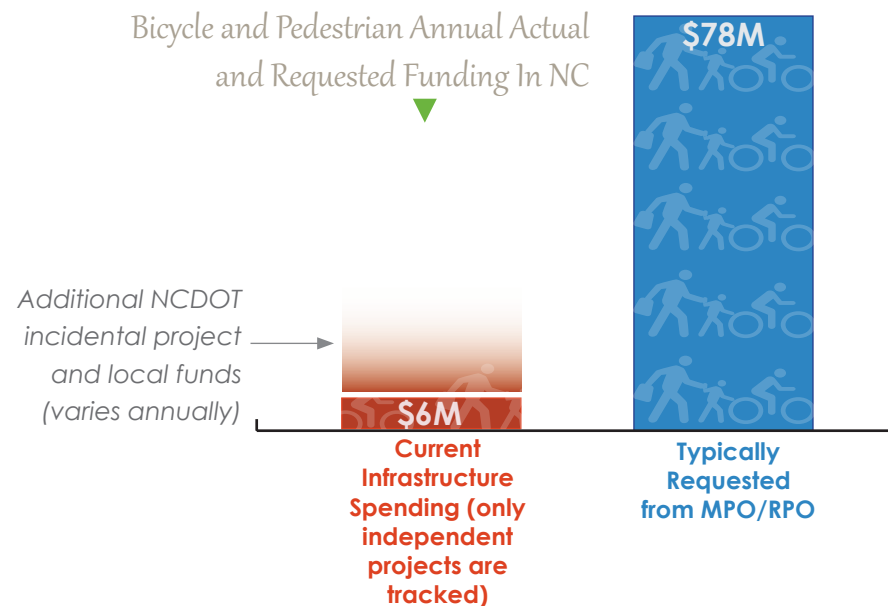


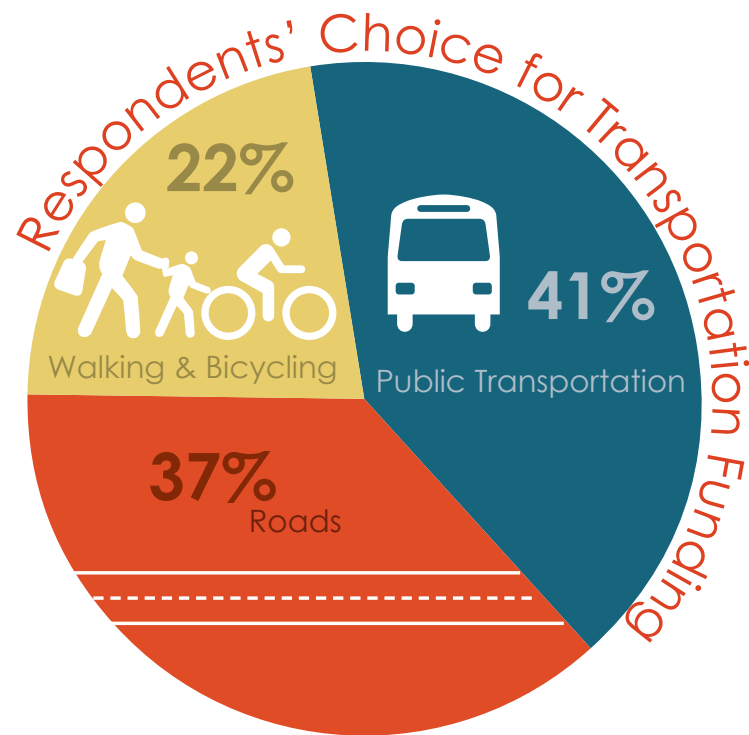
MOBILITY

Needs versus Funding

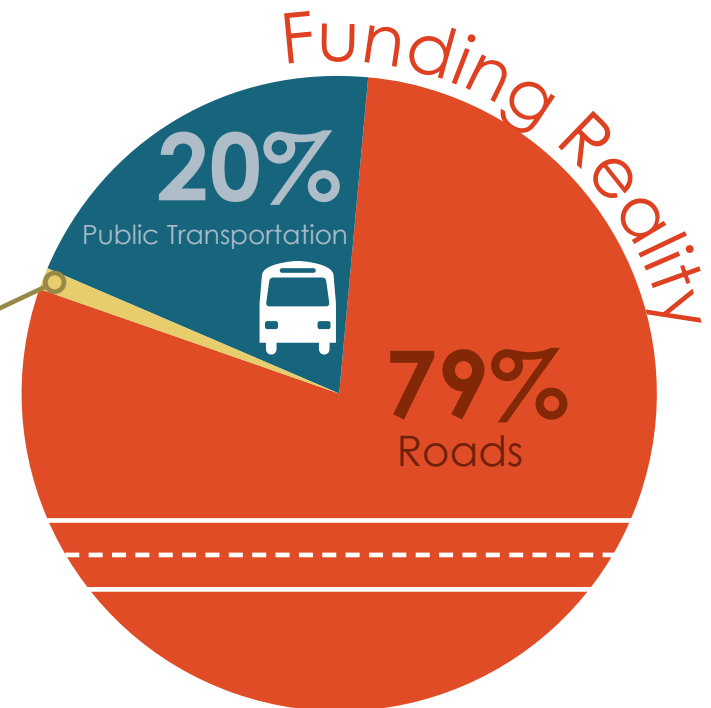
Walking and bicycling are the most efficient types of transportation available. These trips require less infrastructure, reduce congestion, and improve personal health.

However, too often, these forms of transportation are viewed as only recreation-based. Nationally, according to an FHWA National Household Travel Survey completed in 2009, walking trips make up 10.9% of trips (42 billion out of 388 billion annually). Further, every transportation trip begins and ends as a pedestrian. In addition, US citizens believe that more funding should be provided for pedestrian and bicycle infrastructure.





▼ According to a national transportation poll, Americans think differently about transportation funding than the reality of current budget allocation. (Transportation for America, designed by Collective Strength, and fielded by Harris Interactive, 2007)



2

In North Carolina, recent planning initiatives confirm national trends. Currently, only 0.2% of NCDOT funding goes towards independent pedestrian and bicycle infrastructure projects (incidental projects are not currently tracked). As described in Chapter 1, this does not meet the demands of the current population nor does it meet the demands of a growing urban population and elderly population. The 2040 *North Carolina Statewide Transportation Plan* (2012) reports bicycle and pedestrian conditions to be at the low end of level of service “D” (as defined by NCDOT, level of service is the “quality of service from the perspective of the user” and can vary from a “desired state” of LOS A to a failing state of LOS F). If funding levels remained the same (\$4 million per year), the level of service would be “F” by 2022.

MPOs, RPOs, and municipalities who have completed bicycle and pedestrian plans submitted bicycle and pedestrian investment needs of \$78 million per year, a figure that does not reflect the entire state need. Seven MPO/RPO input summits that took place as part of the State

Prioritization process revealed that \$47.4 million should be allocated to bicycle and pedestrian projects per year (ten times the current amount) to raise the level of service to the low end of “C.”

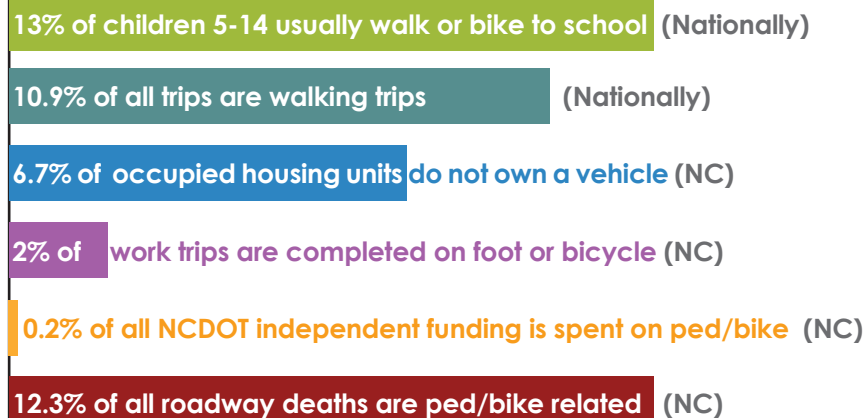
Opportunity to Increase Walking and Bicycling Rates in North Carolina

North Carolinians commuted an average of 23.4 minutes in 2010.¹

42% of commutes are under 10 miles while
58% are above 10 miles.²

While future commuting time and distances are difficult to predict, it is clear that many North Carolinians have chosen to live further from their workplaces than most people would be able to walk or bicycle. However, 42% still live within 10 miles, making walking and biking a more feasible option.

National and North Carolina
statistics related to walking and
bicycling. ►



http://saferoutesinfo.org/sites/default/files/resources/NHTS_school_travel_report_2011_0.pdf
2011 American Community Survey
2008 National Household Travel Survey

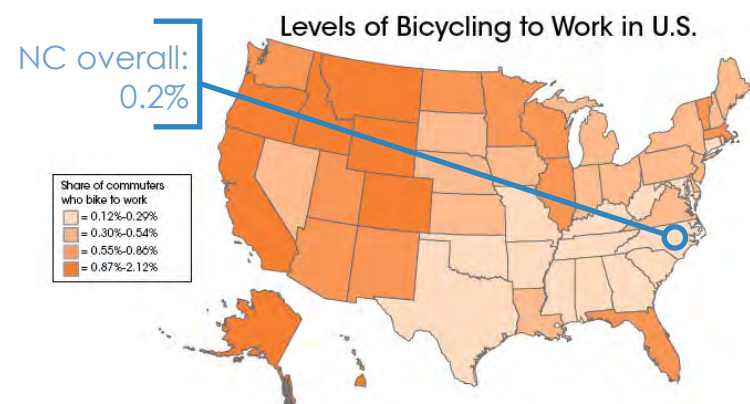
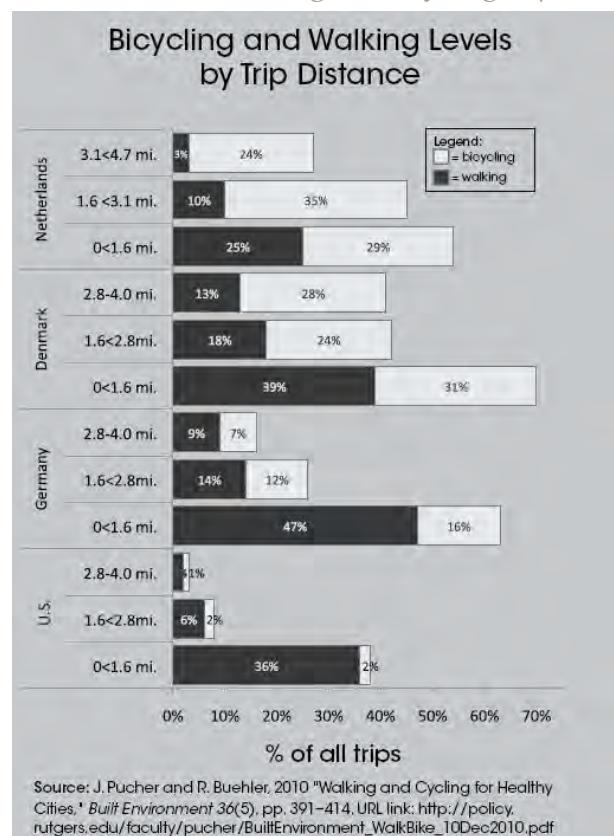


Safe Routes To School initiatives across the state are helping students and parents understand how walking and biking to school can be safe, fun, and good for the environment. This picture in Raleigh took place during Walk to School Day (2012) and featured public engagement activities and entertainment.

Although North Carolina's walking and bicycling levels are low compared to many other states, there is vast potential to increase the percentage of trips that are taken by walking and bicycling. North Carolina places 42nd for walking commute rates and 41st for bicycling commute rates in state rankings.

As discussed previously, trends including an aging population and increasing movement to urban areas suggest an opportunity to increase mode share. In addition, recent studies have noted trends revealing that Millennials—those born between 1981 and 2001—are a part of a generation of declining car ownership.

▼ International Walking and Bicycling Trips Comparison.

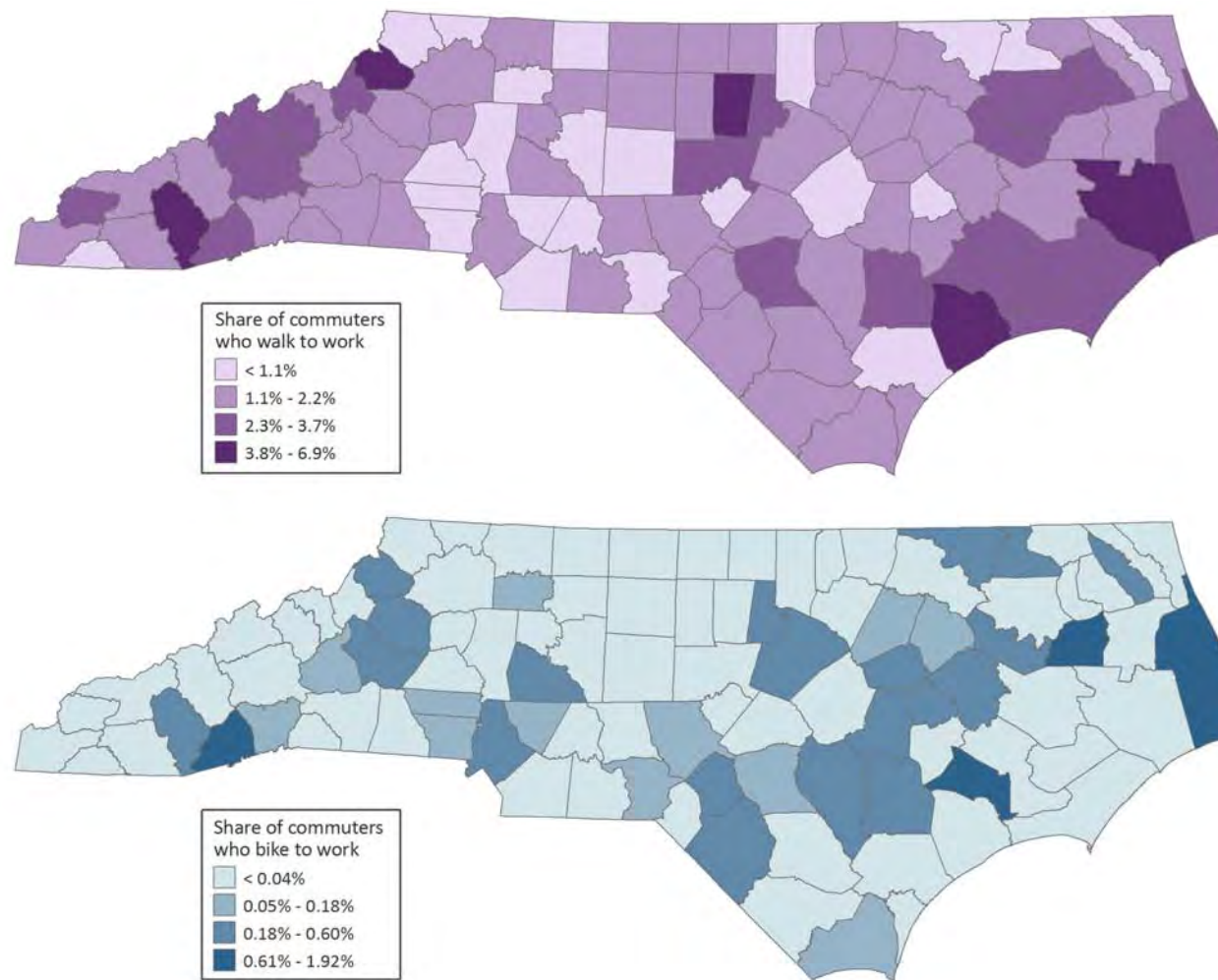


Nationally, North Carolina compares unfavorably with much of the country in terms of the percentage of commuters walking and bicycling to work. Source: Alliance for Biking and Walking 2012 Benchmarking Report, American Community Survey 3-year data, 2007-2009.

An estimated 40% of all trips (commute and non-commute) taken by Americans are less than two miles, equivalent to a bike ride of 10 minutes or less, yet just 13% of all trips are made by walking or bicycling nationwide.³

To put these numbers into perspective, 34% of all trips are made by walking or bicycling in Denmark and Germany,

and 51% of all trips in the Netherlands are by foot or by bike. The figure on 2-31 shows a comparison of the percentage of walking and bicycling trips by distance in the United States, Germany, Denmark, and the Netherlands. While walking rates are relatively comparable, particularly for trips of less than 1.6 miles, the bicycle has been greatly underutilized for short trips in the United States.



◀ North Carolina mode share by county.

Source: Alliance for Biking and Walking 2012 Benchmarking Report, American Community Survey 3-year data, 2007-2009.

Germany, Denmark, and the Netherlands are wealthy countries with high rates of vehicle ownership, like the United States, yet an emphasis on providing quality walking and bicycling facilities has alleviated the reliance on motor vehicles for short trips. **In the United States, bike commuting increased 71% from 2000 to 2009 in the 31 largest Bicycle-Friendly Communities, 62% in the 70 largest cities, and 44% across the United States.** This suggests that bike commuting will increase more significantly in urban areas that have made their communities more walkable and bikeable.

By providing better conditions for pedestrians and bicyclists, North Carolina could likewise take advantage of these low-impact modes. In North Carolina, 70% would walk or bicycle more if safety issues were addressed, according to the 2011 Bicycle and Pedestrian Safety Survey. As described in more detail in the Safety section below, many North Carolinians do not currently feel that they can safely walk or bicycle for daily needs and so are deterred from making trips by foot or bike. This suggests that the provision of safe environments for pedestrians and bicyclists is an important prerequisite for increasing walking and bicycling rates in North Carolina.



SAFETY

Safety Issues in North Carolina

Each year on average, 168 pedestrians and 24 bicyclists are killed in collisions with motor vehicles on North Carolina roads, with many more seriously injured or experiencing evident or possible injuries. The high rates of pedestrian and bicycle crashes, as discussed below, contribute to North Carolina's ranking as one of the least

safe states for walking and bicycling. 12.3% of all traffic fatalities are bicyclists and pedestrians in North Carolina.³

In its 2012 Benchmarking Report, the Alliance for Biking and Walking ranked North Carolina 41st and 44th lowest for pedestrian and bicyclist safety, respectively.

State	Mode Share*	Total Fatalities**	% of Total**	Fatalities (per 1000 bicyclists/pedestrians)
North Carolina	2.0%	162	12.3%	1.898
Oregon	6.0%	43	11.4%	0.416
Minnesota	3.7%	52	12.4%	0.519
Colorado	4.2%	57	12.3%	0.554
Montana	6.4%	16	7.3%	0.533
Alaska	9.2%	11	17.2%	0.359
California	3.7%	662	21.5%	1.098
Virginia	2.7%	89.3	10.2%	0.866
South Carolina	2.2%	114.3	13.3%	2.694
Georgia	1.8%	168.7	10.7%	2.239
Florida	2.2%	612.3	21.0%	3.386

Average yearly fatalities due to motor vehicle collisions.⁴ This table compares North Carolina to surrounding states and states with higher mode shares. In general, states with higher mode shares and better facilities have lower fatality rates.

*2006-2010 ACS 5 year estimates

**NHTSA 2009

In North Carolina, there are 10.0 bicycle fatalities per 10,000 daily bicyclists (which ranks sixth worst in the country). There are 9.0 pedestrian fatalities per 10,000 daily pedestrians (which ranks 10th worst in the country).³ When compared to states that feature higher bicycle and pedestrian modeshare (in other words, more bicyclists and pedestrians), North Carolina has a significantly higher per-capita fatality rate as seen in the table below:

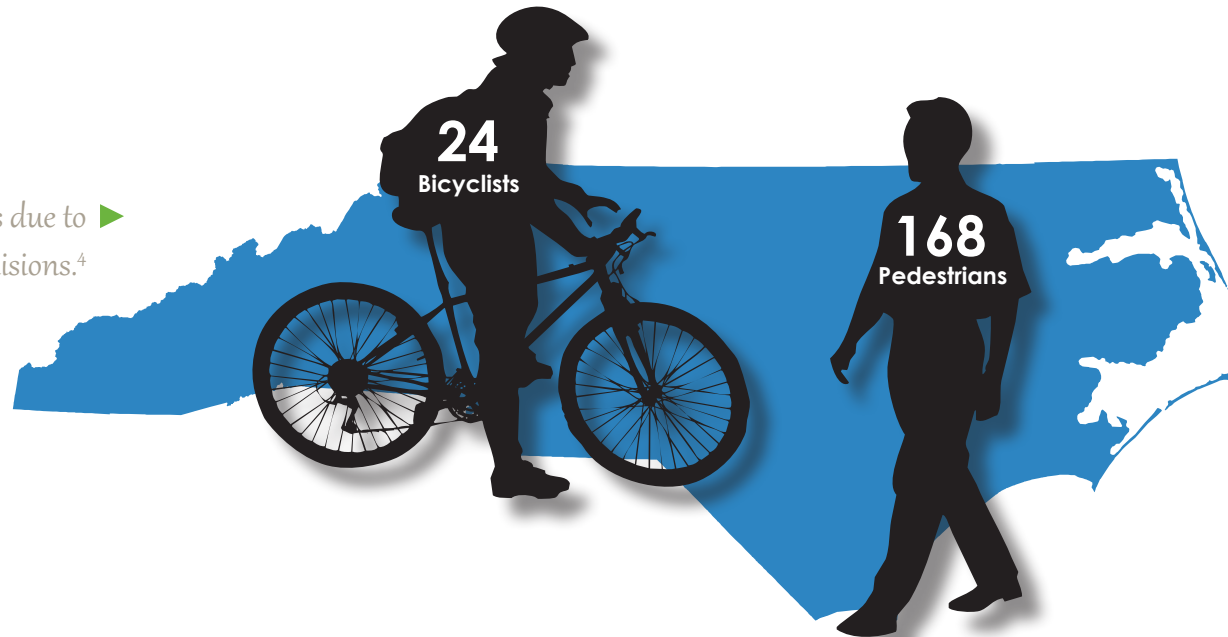
During the five-year period from 2005 to 2009, a total of 4,824 bicycle-motor vehicle crashes and 12,419 pedestrian-motor vehicle crashes were reported to North Carolina authorities. Crashes involving bicyclists and pedestrians are under-reported, so the number of individuals involved in and possibly injured in bicycle or pedestrian collisions is likely even higher than what is shown on record. These numbers show the prevalence and severity of pedestrian and bicycle crashes in North Carolina and highlight a major public safety issue in our state.

Safety Trends in North Carolina⁴

The majority of pedestrian and bicycle collisions occur in areas within municipal limits in North Carolina, classified as urban areas. From 2005 to 2009, 70% of North Carolina pedestrian collisions and 69% of bicycle collisions occurred in urban areas, with the remaining crashes occurring in unincorporated areas of the state. When 2005-2009 crash sites were classified by development density, 85% of pedestrian crashes and 84% of bicycle crashes occurred in areas that were at least 30% developed, showing an even greater prevalence of urban area collisions. This is likely due to higher rates of walking and biking in these areas.

The 2005 to 2009 data also revealed important trends related to minorities and safety. For example, Black/African-Americans were found to be over-represented as pedestrians and bicyclists involved in crashes. Black/African-Americans make up 22% of the North Carolina population, yet 39% of pedestrians and bicyclists

Average yearly fatalities due to
motor vehicle collisions.⁴



involved in crashes from 2005-2009 were reported to be Black/African-American. These results suggest that African-Americans may be disproportionately exposed to crash risks due to greater walking and bicycling rates, characteristics of the built environment that affect safety, or other factors.

Pedestrian-motor vehicle collisions can be classified into several different types. From 2005 to 2009, some of the most prevalent types of pedestrian-motor vehicle crashes were:

Rank	Grouped Pedestrian Crash Type	Total	Percent of NC Total
#1	Unusual Circumstances	2511	20.2%
#2	Crossing Roadway - Vehicle Not Turning	2058	16.6%
#3	Off Roadway	1540	12.4%
#4	Backing Vehicle	1307	10.5%
#5	Walking Along Roadway	1203	9.7%
#6	Dash/Dart-Out	1094	8.8%
#7	Crossing Roadway - Vehicle Turning	862	6.9%
#8	Pedestrian in Roadway - Circumstances Unknown	676	5.4%

North Carolina pedestrian crash type groups, 2005-2009.

Source: University of North Carolina Highway Safety Research Center.

Unusual Circumstances accounted for several different collision scenarios, including vehicles colliding with other vehicles or objects before striking a pedestrian, pedestrians striking vehicles, and vehicular assault. The other most common types of collisions involve pedestrians being hit while crossing a roadway, while walking in an off-road environment such as in a parking lot or across a driveway, while a vehicle is reversing, or while walking along the side of the road. Providing greater opportunities for pedestrians to safely and visibly cross and walk along the roadway could help to reduce the risk of these types of crashes. Crosswalks,

pedestrian signals, and sidewalks along roadways and in parking lots would all contribute to improved pedestrian safety in these instances.

Some types of bicycle-motor vehicle crashes were also found to be more prevalent than others. Motorist Overtaking Bicyclist was the most commonly reported bicycle crash type from 2005-2009 (16.8%). These crashes occur when a motorist attempts to pass a bicyclist and does not see the bicyclist, passes too closely, or otherwise fails to clear the bicyclist while passing. Other common crash types were:

Rank	Grouped Bicyclist Crash Type	Total	Percent of NC Total
#1	Motorist Overtaking Bicyclist	810	16.8%
#2	Motorist Failed to Yield - Sign-Controlled Intersection	468	9.7%
#3	Bicyclist Failed to Yield - Midblock	426	8.8%
#4	Bicyclist Failed to Yield - Sign-Controlled Intersection	382	7.9%
#5	Motorist Left Turn/Merge	326	6.8%
#6	Motorist Failed to Yield - Midblock	302	6.3%
#7	Bicyclist Left Turn/Merge	295	6.1%
#8	Crossing Paths - Other Circumstances	247	5.1%
#9	Bicyclist Failed to Yield - Signalized Intersection	229	4.7%
#10	Motorist Right Turn/Merge	220	4.6%

North Carolina bicycle crash type groups, 2005-2009. Source: University of North Carolina Highway Safety Research Center.

The issue of a motorist or bicyclist failing to yield often occurs when a motorist or bicyclist misjudges the speed of the approaching vehicle and the time available to cross the road or intersection, or when a motorist or bicyclist does not

Installing sidewalk has been shown to reduce crashes involving pedestrians by 88% (Right: NC 105 in Boone). ►



see the approaching vehicle in time. Poor lighting, the lack of many signalized intersections to detect bicyclists waiting at red lights, and lack of appropriate bicycle facilities may all contribute to these types of crashes. Of all bicycle-motor vehicle crashes in North Carolina from 2005-2009, 62.2% occurred when the bicyclist was in a roadway travel lane. Only 4.7% of collisions involved a bicyclist positioned in a bike lane or on a paved shoulder. A lack of designated bicycle facilities on the roadway may therefore be a primary risk factor for bicycle-motor vehicle crashes in North Carolina.

Safety benefits can be made with walking and bicycling improvements. Studies show that installing pedestrian and bicycle facilities directly improves safety by reducing the risk of pedestrian-automobile and bicycle-automobile crashes. The following table provides examples of common pedestrian design treatments and their resulting collision rate reductions.

Bicycle and pedestrian crash analysis will inform facility, program, and policy recommendations found in the following chapters. Bicycle and pedestrian safety recommendations can be found in Chapter 4.

Design Treatment	Crash Reduction Rate
Install sidewalk	88% (pedestrian crashes)
Install pedestrian countdown signal heads	25% (pedestrian fatal/injury crashes)
Install pedestrian refuge islands	56% (pedestrian crashes)
Improve lighting at intersections	42% (pedestrian injury crashes)
Install raised crosswalk	36% (pedestrian fatal/injury crashes)

Federal Highway Administration. (2008). "Desktop reference for crash reduction factors."

North Carolina 2011 Bicycle and Pedestrian Safety Survey

The 2011 Bicycle and Pedestrian Safety Survey was administered by the Institute for Transportation Research and Education (ITRE) to gather information on North Carolinians' concerns, attitudes, and ideas for improvement regarding walking and bicycling safety. More than 16,000 responses were collected. The survey found that 80% of respondents feel that bicycling for daily needs is currently somewhat or

very dangerous, while 43% said that walking for daily needs is currently somewhat or very dangerous.

Top five bicycle and pedestrian safety issues cited:

1. Lack of on-roadway bicycle facilities (82%)
2. Lack of pedestrian paths and sidewalks (63%)
3. Lack of alternatives to cycling on main arterials (55%)
4. Lack of bicycle paths and greenways (53%)
5. Motorists or bicyclists not sharing the road (50%)

According to survey respondents, the facility improvements that are most needed to improve safety for pedestrians and bicyclists are bike lanes on collectors and arterials (84%), sidewalks on collector streets and in commercial corridors (64%), paths and greenways (63%), and sidewalks on local and neighborhood streets (63%).

Top three selected solutions to improve pedestrian safety:

1. Improve roadway design to accommodate pedestrians as regular users and include sidewalks as a standard feature (79%)
2. Retrofit existing roads to add sidewalks (67%)
3. Build more paths and greenways (61%)

Top three selected solutions to improve bicycle safety:

1. Improve roadway design to accommodate cyclists as regular users and include bike lanes as a standard feature (84%)
2. Retrofit existing roads to add bike lanes (70%)
3. Build more paths and greenways (54%)

The results of the survey help NCDOT to identify the safety issues that are of greatest concern to North Carolinians and the improvements that can be made to most effectively encourage safe walking and bicycling in the state.



HEALTH

Health is not merely the absence of illness. It is determined by how we live, work, learn and play, not just how often we visit the doctor. A healthy community is one with physical and social environments that make healthy choices the easy choices. In recent decades, we have built physical activity out of our lives and environments. Our transportation system is a major part of the physical environment, and it currently poses barriers to better health in North Carolina.

Reasons for Action

North Carolinians' health outcomes are largely impacted by chronic diseases like cancer, heart disease, stroke and diabetes. Three important health behaviors - physical activity, nutrition and tobacco - help determine our health outcomes throughout life. Obesity and overweight, which

65% of North Carolina adults are either

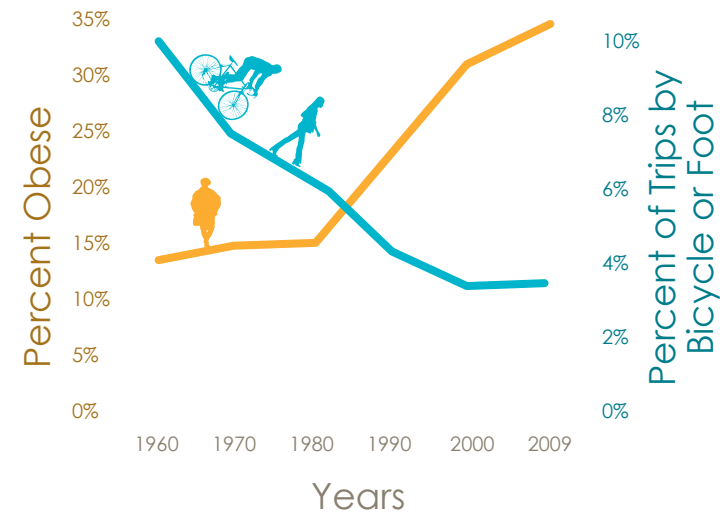
overweight or obese; North Carolina also is

ranked 5th in the nation for childhood obesity⁵

are mainly caused by consuming too many calories and expending too little energy, are increasing problems in our state. We are in the midst of an epidemic of obesity. The rate of obesity in North Carolina has more than doubled from 13% in 1990 to 28.6% in 2010.⁴ If current trends persist, an estimated 58% of North Carolina adults will be obese by 2030. By continuing on this trajectory, the number of chronic physical conditions would increase dramatically, including heart disease, arthritis and diabetes. But you cannot solely blame individuals for this epidemic if the environment they

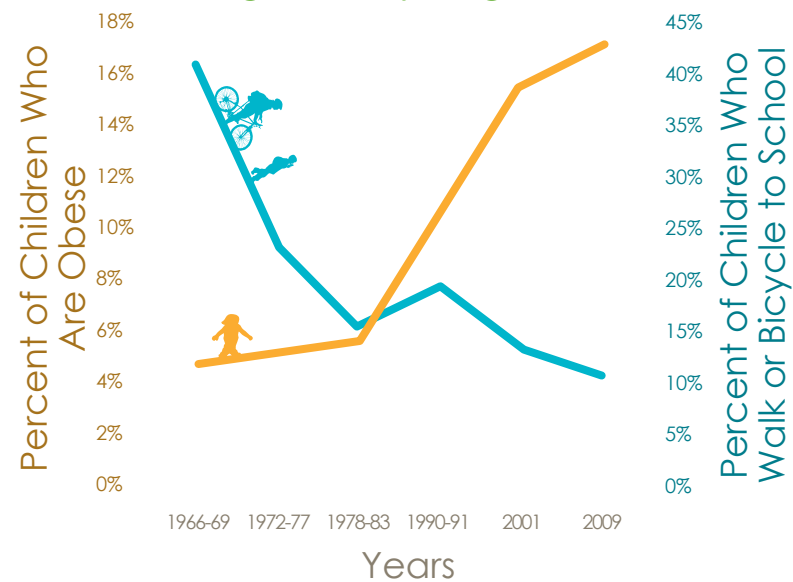
Change in Walking and Bicycling Rates vs. Adult Obesity Rates

Sources: Ogden and Carroll 2010, Census 1960, 1970, 1980, 1990, 2000, ACS 2009. Note: bicycling was not separated from 'other' modes in early Census surveys, so 1960 and 1970 levels show are for walking only; $r=-0.93$ (bicycle + walk/overweight); $r=-0.87$ (bicycle + walk/obesity). Note that it should not be implied that obesity is caused solely by less bicycling and walking.



Trend in Obese Children vs. Rate of Walking and Bicycling to School

Sources: CDC, NHANES, McDonald 2007, Ogden and Carroll 2010, NHTS 2009. Note: $r=-0.70$. Note that it should not be implied that obesity is caused solely by less bicycling and walking.



live in does not make physical activity options accessible. It is hard to imagine the added human toll and economic burdens to North Carolina residents, families, insurers and governments.

Critical Disparities in Health

Among low-income people and people of color in North Carolina, physical inactivity, obesity, and diabetes rates are higher than the state average, posing much greater health risks among these populations. The prevalence of these largely preventable conditions reflect limited or nonexistent access to healthy choices. In addition, older adults and people with disabilities are more likely to live with chronic diseases. Finally, children are perhaps the most vulnerable and yet hold the greatest potential to

learn and adopt healthy behaviors that can last a lifetime.

The Financial Cost of Physical Inactivity in North Carolina

Most of us have lost loved ones to chronic disease, and/or we live with these conditions within our families. The human burden of pain and suffering is clear. What is increasingly obvious is the financial burden from chronic diseases. Recent reports have estimated the annual direct medical cost of physical inactivity in North Carolina at \$3.67 billion, plus an additional \$4.71 billion in lost productivity. While these financial figures are bleak, researchers have found that every dollar invested in accessible pedestrian and bicycle trails can result in a savings of nearly \$300 in direct medical expenses.



◀ Providing safe paths for pedestrians will encourage more people to walk, and therefore promote a healthier community. (Left: Mt. Airy Ararat River Greenway).

Better Health through Active Transportation

The good news is that we can stop or reverse the trend towards higher disease rates in North Carolina. Regular physical activity is one of the simplest solutions to give ourselves a longer, healthier life. Increasing one's level of physical activity reduces the risk and impact of cardiovascular disease, diabetes, and some cancers. It also helps to control weight, improves mood, and reduces the risk of premature death.⁶ Furthermore, regardless of one's weight, regular physical activity delays the onset and reduces the likelihood of developing chronic diseases. Children and adults can lead measurably healthier lives by incorporating 30 or more minutes of activity each day. Using active transportation to and from school, work, parks, restaurants, stores and other routine destinations is one of the best things we can do to prevent chronic diseases.

Of North Carolinians surveyed, 60% would increase their level of physical activity if they had better access to sidewalks and trails.⁷

The public health impacts of the transportation system extend beyond physical inactivity and obesity. By shifting more North Carolinians to walking and bicycling for transportation, even for small trips, the state will reduce automobile emissions and improve air quality. Cleaner air leads to fewer symptoms and illnesses for those suffering from asthma and other chronic respiratory conditions.

Health professionals and advocates have become new partners in promoting and planning for active transportation. After carefully considering the best science and converging

evidence, public health authorities, including the Centers for Disease Control and Prevention and the Institute of Medicine, have recommended road improvements, connectivity, land use policies, active transportation to schools, and programs to advance walking and bicycling.

North Carolina Action towards a Healthier Transportation System

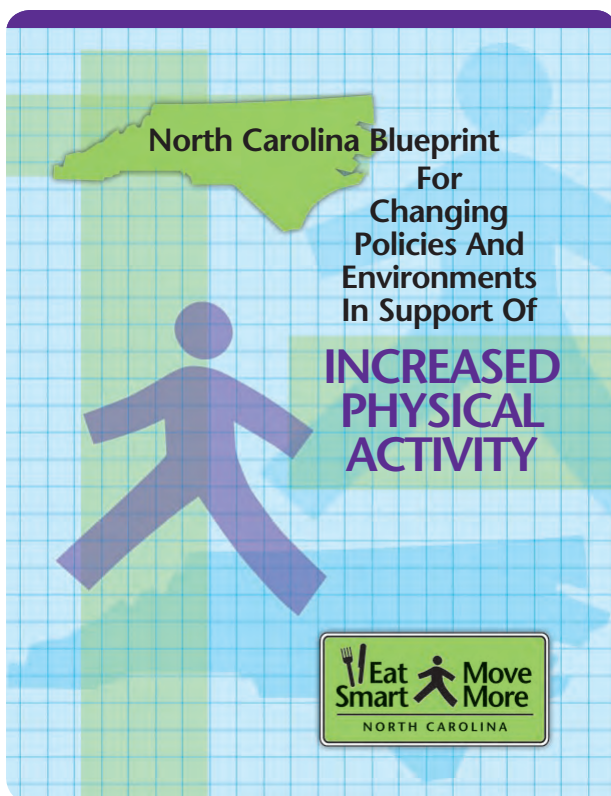
In many aspects, North Carolina is helping lead the way with innovative approaches to collaboration and action to improve health through active transportation. Planning processes led by NCDOT have brought many health professionals and advocates into important transportation planning efforts.

In 2012, NCDOT's Board of Transportation adapted its mission statement to include "health and well-being" and passed a "Public Health Policy," which declares the importance of a transportation system that supports positive health outcomes.

The North Carolina Department of Health and Human Services (NC DHHS) is recognized as a leader among state health departments for its approaches to improving health and healthier community design. It has done this by identifying the top health issues and evidence-based prevention strategies for active transportation. NC DHHS supports local communities with training, technical

assistance and grant opportunities. In 2005, NCDHHS initiated and convened the Healthy Environments Collaborative (HEC), which includes the departments of Transportation, Commerce, and Environment and Natural Resources. The HEC was formed to consider the health impacts of each department's work and collaborate in improving health in North Carolina. Health funders, like Blue Cross Blue Shield Foundation of North Carolina, major health systems, and private businesses across the state also recognize the importance of creating projects and programs that link active transportation to health outcomes.

The Eat Smart, Move More coalition has also been addressing health and physical activity in North Carolina and is composed of a broad leadership team. The organization provides funding for projects that promote physical activity. The organization has also developed a number of reports including: Eat Smart, Move More: North Carolina's Plan to Prevent Overweight, Obesity, and Related Chronic Diseases (2007-2012) and the North Carolina Blueprint for Changing Policies and Environments in Support of Increased Physical Activity.



Health Impact Assessments

Health Impact Assessments (HIAs) analyze policies, plans or projects - prior to approval - to determine their public health effects. Within North Carolina, HIAs are gaining momentum as a process to determine the impacts of active transportation projects. HIAs have been recently completed or are currently underway in Aberdeen (*Pedestrian Transportation Plan*), Charlotte (*The Effect of Light Rail Transit on Body Mass Index and Physical Activity*), Davidson (*Public Health and Neighborhood Design Standards*), Haywood County (*Haywood County Comprehensive Bicycle Plan*), Raleigh (*Blue Ridge Road Corridor*), and Wilmington/New Hanover County (*Wilmington/New Hanover County Greenway Plan*).

The Charlotte 'Light Rail' study found that residents who switched to using light rail weighed an average of six and a half pounds less than those who continued to drive to work.



ECONOMICS

While they are currently a small part of the North Carolina economy, walking and bicycling activities generate significant economic benefits. Facilities for bicyclists and pedestrians generate economic returns through improved health, safety, and environmental conditions, raise property values, and attract visitors.

With its mild climate, North Carolina is well-suited to attracting tourists from out of state through bicycle and pedestrian activities. North Carolina is the 6th most visited State in the United States and 2011 was a record year as visitors spent \$18 billion. North Carolina hosted approximately 23 million overnight visitors in 2011, many of whom partook in activities related to walking or biking.⁸ 2% of out-of-state tourists reported bicycling while on vacation, and 4% participated in hiking activities.⁹ Tourists unfamiliar with the state will likely be drawn in particular to facilities that make bicycling and cycling safer and easier.

Walking and biking are also economically efficient transportation modes. Many North Carolinians cannot afford to own a vehicle and are dependent on walking and biking for transportation.

*6.7% of occupied housing unit residents
in North Carolina do not own a vehicle.¹⁰*

The rising gas prices of recent years have made an impact on Americans of varying income levels. Although this increase can't be attributed to gas prices alone, 2008 was the year with the highest recorded rate of increase in bike commuting in the last decade.

During the 2008 gas spike, many bike shops felt this rise in bike commuting. That August, Bikes Belong surveyed more than 150 bike retailers from nearly 40 states. **Seventy-three percent of retailers said they were selling more transportation-related bicycles. Nearly every shop (95%) had customers citing high gas prices as a reason for their purchase, and four in five retailers said gas prices were helping them sell more bikes.**¹¹ According to a 1997 survey

of bike commuters, 46% said they ride to save money on gasoline.¹²

Current Bicycle and Pedestrian-Related Programs Generating Economic Activity

North Carolina is also home to many cultural events that rely on walking or bicycling. These events, including car-free street days, street festivals, and art walks, have the potential to generate economic benefits by attracting out-of-town visitors, improving property values by increasing the appeal of communities, and encouraging healthy activity. Currently, Durham hosts the "Bull City Summer Streets" event, in which downtown streets are closed to cars on scheduled weekend days to make room for bicyclists, pedestrians, rollerbladers, and dance activities. Cities throughout North Carolina hold regular art walks, in which local artists with shops located on a scheduled route show and sell wares, often accompanied by live music and other attractions. Such events could be further increased, improved, or expanded through changes that make traveling on foot easier and safer.

The North Carolina Department of Commerce's Main Street Program assists small towns in making improvements to reestablish their downtowns as thriving economic centers. Since the Program's start in 1980, towns have experienced a total gain of \$1.66 billion in new investment and 14,600 new jobs.¹³ While the Main Street Program takes a wide approach to improving downtowns that includes promotions, community partnerships, and design improvements, among other strategies, many plans completed through the Program include initiatives to make streets more bicycle and pedestrian friendly. Towns have focused on improving sidewalk connectivity, creating marked walking routes, installing bike lanes, and

implementing street-level design improvements for a more enjoyable walking experience. Transforming downtown shopping into an enjoyable, active experience has helped towns attract consumer spending that might previously have occurred at larger shopping centers outside their tax base and improve downtown property values.

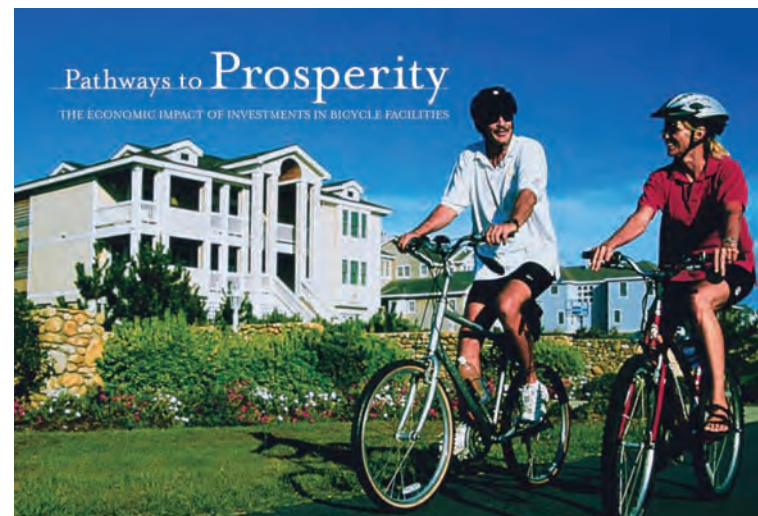
Economic Impact Analyses

The Economic Impact of Investments in Bicycle Facilities: A Case Study of the Northern Outer Banks

A 2004 study of investments in bicycle facilities on the Outer Banks found substantial benefits from bicycle-related tourism. An estimated 680,000 visitors were found to bicycle in the area annually, resulting in an annual economic impact of \$60 million.¹⁴ The study found that the economic benefits of bicycle facilities from tourism expenditures alone far outweigh the costs of constructing the facilities. Approximately \$6.7 million of municipal, state and federal funds were used to construct the special bicycle facilities in the northern Outer Banks. Other economic benefits, including increased property values and reduced healthcare costs, further improve the ratio of benefits to costs.

Ecusta Rail-to-Trail Economic Impact Analysis

Additionally, a 2012 study of the proposed 20-mile Ecusta Rail Trail in Hendersonville and Transylvania Counties found that the project would create 180 construction jobs and 27 permanent jobs and would attract 20,000 visitors annually. As a result of increased property values near the trail, the project is expected to generate an additional \$160,000 per year in property tax revenues, among other benefits.¹⁵





ENVIRONMENT

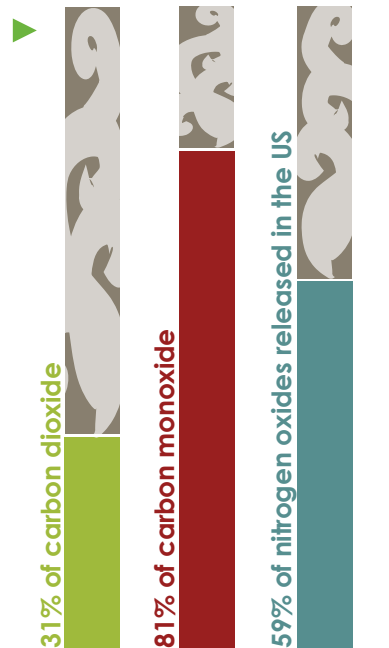
Environmental stewardship, for the purposes of this Plan, addresses the impact that transportation and land use decisions (both at the government/policy level and personal level) can have on the air and landscapes that North Carolinians and tourists both enjoy. Environmental sensitivity and resource protection are strong goals of NCDOT and walking and bicycling are integral to achieving those goals. Even a modest increase in walking and bicycling trips (in place of motor vehicle trips) can have significant positive impacts to air and water quality. For example, replacing two miles of driving each

day with walking or bicycling will, in one year, prevent 730 pounds of carbon dioxide from entering the atmosphere.

According to the National Association of Realtors and Transportation for America, 89% of Americans believe that transportation investments should support the goal of reducing energy use.

Motor Vehicle Emissions Represent:

Sources: The Green Commuter, a publication of the Clean Air Council & WorldWatch Institute.



Environmental stewardship is represented in many ways across North Carolina today from transportation planning, statewide trails, recreation areas, and environmental education. Walking and bicycling trails through North Carolina landscapes enable tourism, recreation, and environmental education opportunities.

The Conservation Planning Tool (CPT), developed by the North Carolina Department of the Environment and Natural Resources (DENR), has already been used in comprehensive, long-range transportation planning in North Carolina. This tool identifies important natural heritage features, unique landscapes, farmlands, high-quality forests, etc. and is helping planners make more informed land use and transportation decisions.

OneNC Naturally
Conservation Planning Tool

While the statewide plan focuses primarily on utilitarian transportation, it should also be recognized that walking and bicycling are significant recreational and tourism activities in North Carolina as well. In the 2009 Systemwide

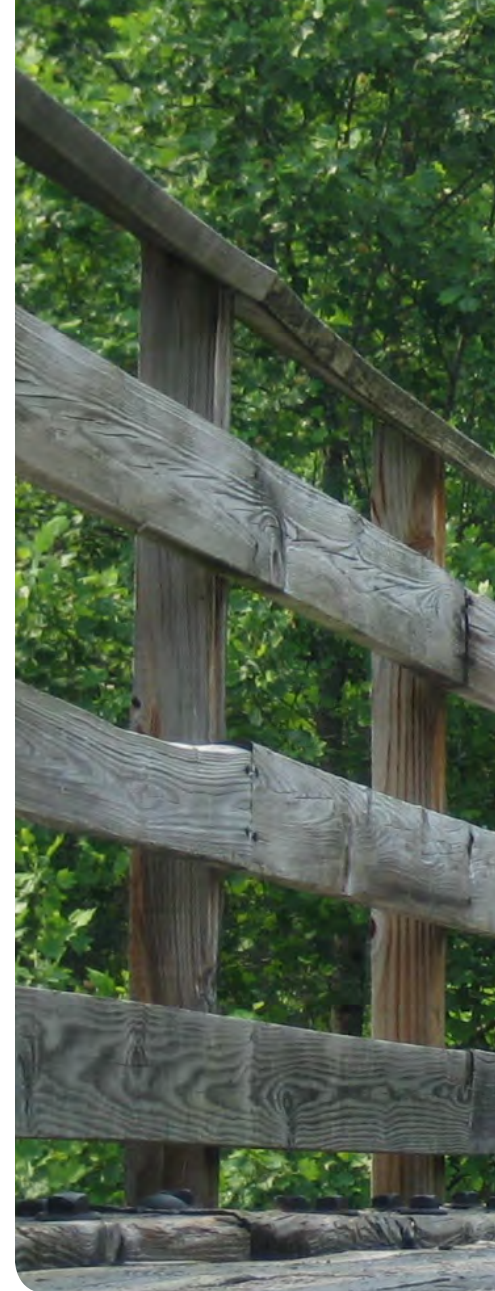
Plan for State Parks, trails (including shared-use trails) were found to be the most popular facilities in the park system.¹⁶ The 2009-2013 *Statewide Comprehensive Outdoor Recreation Plan* (SCORP), found “walking for pleasure” to be the most common outdoor recreational activity, enjoyed by 82% of respondents, and bicycling by 31% of respondents.¹⁷ DPR is in the process of developing a comprehensive state and regional trails plan for North Carolina.

As of 2008, the North Carolina State Parks system consisted of 72 public use areas, including parks, recreation areas, natural areas, rivers, trails, and lakes, totaling 204,847 acres. Park resources can help mitigate climate, air, and water pollution, which contribute to impacts on public health.

Environmental education is another important component for fostering stewardship in future generations. Since its formation in 1990, the Office of Environmental Education of the North Carolina Department of Environment and Natural Resources (NCDENR) has led the initiative for environmental education within North Carolina. In 1996, NCDENR established the first environmental education certification program in the nation, and it is also responsible for integrating environmental education into the NC Department of Public Instruction's Curriculum Standards in 1997. An earth/environmental science course is now a prerequisite to graduation for North Carolina high school students.

Transportation, land use, and resource protection issues must be considered together and are evaluated in detail in this Plan. Environmental education and other stewardship opportunities will be promoted in tandem with the Statewide Pedestrian and Bicycle Plan by involving the expertise and perspective of NCDPR and NCDENR as planning partners.

Walking and
biking is a great
way to enjoy our
state's natural
resources - and
protect them too!





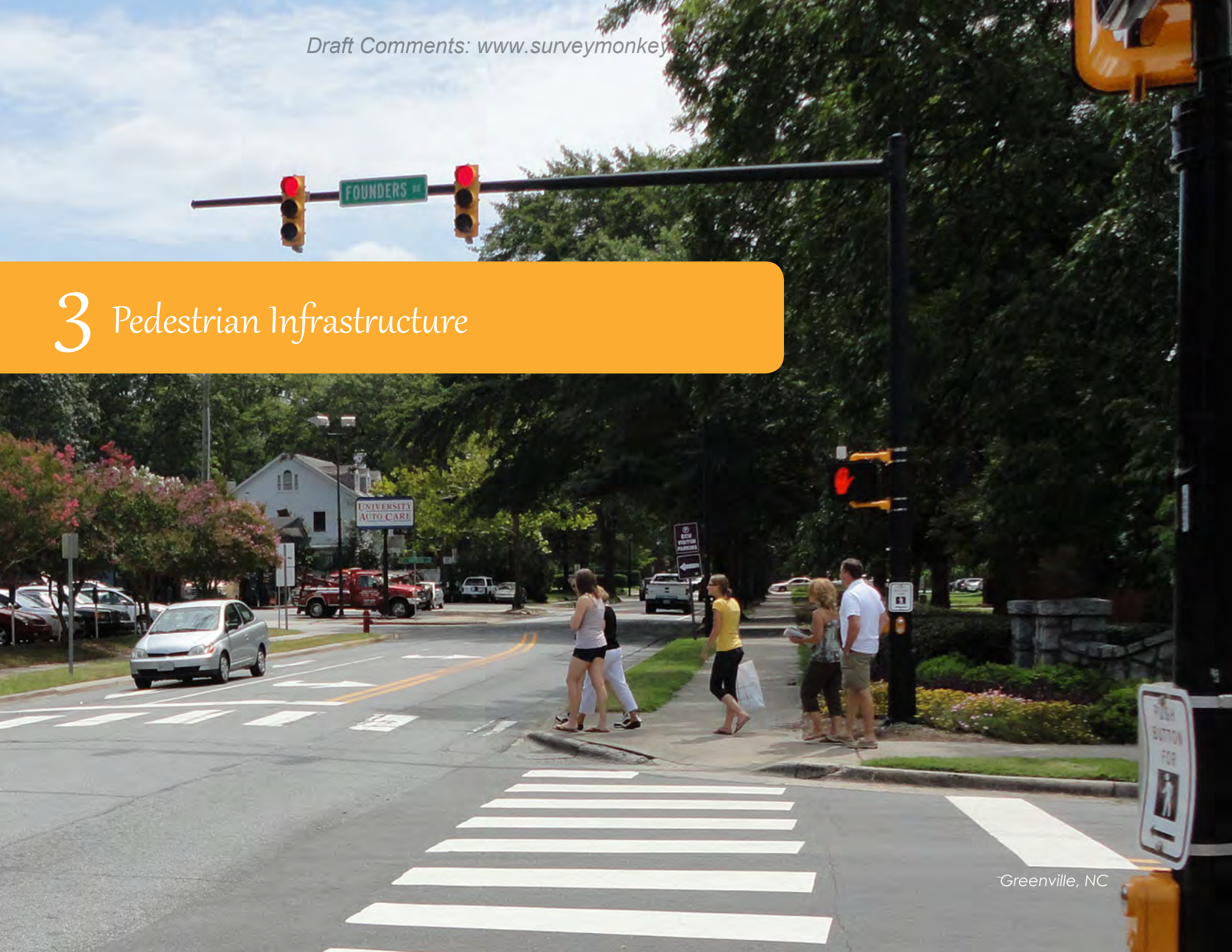
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Draft Comments: www.surveymonkey.com/s/WalkBikeNC_Draft

3 Pedestrian Infrastructure



OVERVIEW

Walkability is a critical element of North Carolina's mobility, economic development, public health, and environmental sustainability. Walking is an important mode of transportation for children, the elderly, people who cannot afford to own and operate a car, and those who choose not to own a car. In fact, according to the American Community Survey, more than 234,000 households (or around 6.5%) in North Carolina do not own an automobile. Walkability is important to a vibrant economy, while also providing people with an affordable way of incorporating physical exercise into their daily routine, and helping to fight obesity and related chronic diseases.

North Carolinians place a high value on their ability to walk throughout all parts of the State. The state has an impressive track record of supporting pedestrian planning. For example, the North Carolina Complete Streets policy and accompanying design guidelines focus heavily on strategies to improve pedestrian comfort and accessibility.

However, walking for transportation is not an equivalent choice to driving today in North Carolina. There remains a lack of pedestrian network connectivity, with sidewalk gaps, missing marked crosswalks, lack of curb ramps, excess driveway conflict areas, and disconnected land uses commonplace. In addition, thousands of pedestrians are struck by motorists every year.

Common Pedestrian Issues Throughout the State

Pedestrian plans funded through the Planning Grant Initiative detail a number of pedestrian issues that are common throughout the State. A few examples are listed below.

Charlotte Pedestrian Master Plan (2009)

"Inside Route 4, one finds a robust sidewalk network, planting strips, connectivity between destinations, pedestrian signals, transit and a range of land uses in close proximity. Outside Route 4, the road network consists of thoroughfares and collector roadways that lack sidewalks or crossing facilities, disconnected local streets, and separated land uses that prevent residents from walking to the store, park, or their child's school."

In this Chapter

Overview

Types of Pedestrians

Pedestrian Facility
Preferences and Factors
Discouraging Walking

Pedestrian Facility Types

Pedestrian Issues

Current Process for
Funding and Constructing
Pedestrian Facilities

Recommendations

Hertford Comprehensive Pedestrian Plan (2007)

"Sidewalks in Hertford are primarily located within the downtown area... Although there are adequate sidewalk facilities in downtown Hertford, it is clear that the Town will need pedestrian access from residential areas to major destinations such as the Perquimans County Recreation Center and schools."

Holly Springs Pedestrian Plan (2007)

"The majority of sidewalks found within the Town of Holly Springs are concentrated in individual neighborhoods... However, pedestrian connections between neighborhoods/subdivisions, the downtown, and schools are inadequate with many gaps, or non-existent, particularly along arterial roadways."

Wilmington Pedestrian Plan (2011)

"The pedestrian experience varies dramatically in different parts of Wilmington. The historic downtown area has a rich system of sidewalks, marked crosswalks,

signalized intersections, and other accommodations for walkers... However, along many of the city's major arterials, people must walk along busy roadways, and there are many areas where there are no sidewalks or crosswalks, resulting in an unpleasant pedestrian environment."

While not necessarily comprehensive, these statements demonstrate the broad range of pedestrian conditions that exist throughout the state, as well as within each community. For example, the plans highlight that urban areas tend to have more sidewalks, traffic signals, access to transit, and land-use patterns that support walking. There are greenways, paved shoulders, and amenities such as traffic signals and crosswalks throughout the state; however, there are notable pedestrian-related challenges in rural areas and in areas that are transitioning, for example from rural to suburban. These include the lack of sidewalks, limited opportunities to cross the road, higher speed traffic, and more distance between destinations.

That being said, there are issues that arise in urban, suburban, and rural areas alike, for example gaps and obstructions in the pedestrian network and unsafe driver behavior. A detailed discussion of the features and amenities that make up the pedestrian network is provided in the pages that follow.

◀ Residents and community leaders in Holly Springs, NC, discuss pedestrian connectivity issues as part of their planning grant from NCDOT.

Following the presentation of pedestrian facility types is a discussion of the process by which pedestrian facilities are planned, designed, and implemented in North Carolina. This chapter then provides recommendations to improve pedestrian conditions through physical, programmatic, and policy level changes.



TYPES OF PEDESTRIANS

Everyone is a pedestrian at some stage in their daily travel. This means pedestrians are a highly diverse road user group which includes children, adults, senior citizens, teenagers, joggers, the disabled and mobility impaired, transit riders, and people using wheeled toys or recreational devices such as skateboards, rollerblades and foot scooters.

Pedestrians have a variety of characteristics so the transportation network should accommodate a variety of needs, abilities, and possible impairments. Age is one major factor that affects pedestrians' physical characteristics, walking speed, and environmental perception. Children have low eye height and walk at slower speeds than adults walk. They also perceive the environment differently at various stages of their cognitive development. Older adults walk more slowly and may require assistive devices for walking stability, sight, and hearing. The table below summarizes common pedestrian characteristics for various age groups.

Sources: AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities (July 2004), Exhibit 2-1, and the US Census Bureau, Interim State Population Projections, 2005. See Chapter 1 of this plan for more on the North Carolina Population Pyramid for 2000 and 2030.

Table 3.1 Pedestrians Characteristics by Age and NC Population

	% NC Population, 2000	% NC Population, 2030
Ages 1-4		
<ul style="list-style-type: none"> Learning to walk Requires constant adult supervision Developing peripheral vision and depth perception 	24% (under 18)	25.2% (under 18)
Ages 5-8		
<ul style="list-style-type: none"> Increasing independence, but still requires supervision Poor depth perception 	24% (under 18)	25.2% (under 18)
Ages 9-13		
<ul style="list-style-type: none"> Susceptible to "dart out" intersection dash Poor judgment Sense of invulnerability Improved awareness of traffic environment 	24% (under 18)	25.2% (under 18)
Ages 14-18		
<ul style="list-style-type: none"> Poor judgment 	24% (under 18)	25.2% (under 18)
Ages 19-40		
<ul style="list-style-type: none"> Active, fully aware of traffic environment 	41% (18-44)	34.6% (18-44)
Ages 41-65		
<ul style="list-style-type: none"> Slowing of reflexes 	22.5% (45-64)	22.4% (45-64)
Ages 65+		
<ul style="list-style-type: none"> Difficulty crossing street Vision loss Difficulty hearing vehicles approaching from behind 	12% (65+)	17.8% (65+)

PEDESTRIAN PREFERENCES AND FACTORS DISCOURAGING WALKING

In 2012, the WalkBikeNC project website allowed visitors to select preferences for pedestrian facility types. The results in Table 3.2 (right) show a preference for sidewalks with grass buffers and for greenways. The table also shows walking in the street and walking on sidewalks without buffers as being the least preferred (see the following pages for brief descriptions of facility types).

Using information collected through NCDOT's Bicycle and Pedestrian Planning Grant Initiative, it is also possible to gauge the factors that discourage walking in North Carolina, with lack of sidewalks and trails being the leading factor in each city/MPO. Table 3.3 (below) shows the results from more than 3,000 comment forms, collected in eight different communities, from 2005-2012.

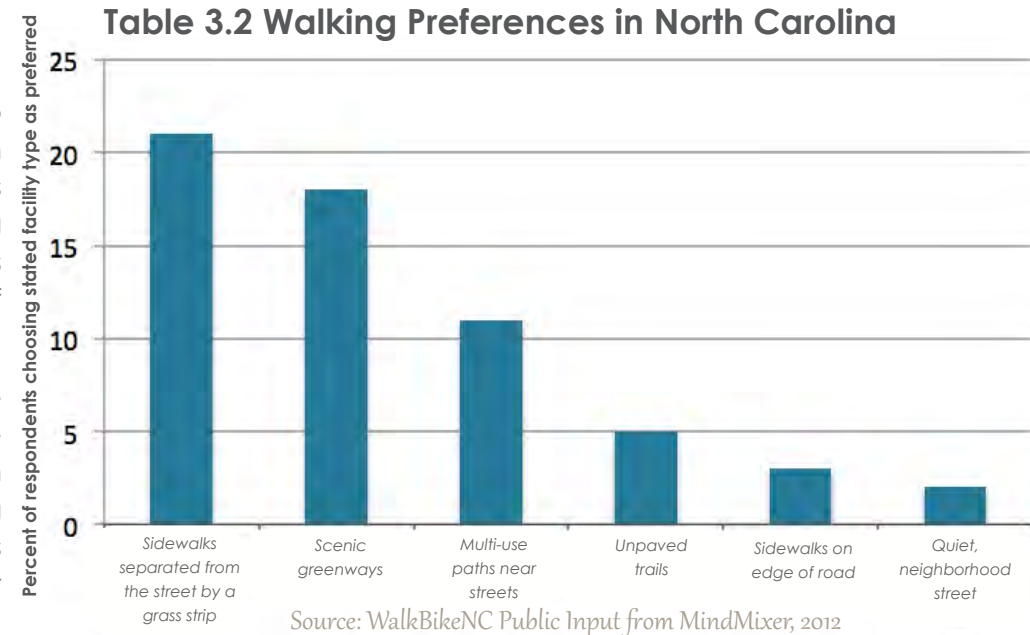


Table 3.3 Top Factors Discouraging Walking in North Carolina Communities

	Lack of sidewalks and trails	Pedestrian unfriendly streets and land uses	Automobile traffic and speed	Unsafe Crossings	Criminal Activity	Aggressive motorist behavior
Greenville Area MPO 694 respondents/2011	#1	#2	#3	-	-	-
Greensboro Urban Area MPO 609 respondents/2005	#1	#2	#3	-	-	-
City of Rocky Mount 570 respondents/2011	#1	-	#3	-	#2	-
City of Burlington 413 respondents/2012	#1	-	#2	-	-	#3
Jacksonville Urban Area MPO 293 respondents/2008	#1	#2	-	#3	-	-
City of Roxboro 243 respondents/2008	#1	-	#2	#3	-	-
City of Belmont 234 respondents/2009	#1	#3	#2	-	-	-
Town of Holly Springs 195 respondents/2007	#1	#2	-	#3	-	-

Source: Public comment forms from each of the above communities, collected as part of their pedestrian transportation planning processes (2005-2012).

PEDESTRIAN FACILITY TYPES

A pedestrian's experience walking along streets and roadways in North Carolina is influenced by a variety of factors such as the presence of sidewalks and/or obstructions in the pedestrian travel way. Safe street crossings are also a critical component of an accessible pedestrian network. The following is a general synthesis of things that affect pedestrians walking along and across roadways in North Carolina.

Along the Roadway

- **Sidewalks:** Sidewalks are the central component of the pedestrian network. Sidewalks and walkways should provide a continuous system of accessible paths for pedestrians. Sidewalks are provided on both local and state-owned roads in North Carolina, and should be regularly included as part of ongoing private development.



Missing sidewalk in Jacksonville, NC

Sidewalk, sidewalk buffer, street trees, and pedestrian-scale lighting in Downtown Belmont, NC.



- Sidewalk Buffers:** A pedestrian's safety and comfort in the roadway environment is significantly affected by the width and quality of the buffer between the sidewalk and the roadway, especially on streets with heavy traffic volumes. Buffers such as on-street parking and street trees enhance pedestrian safety and comfort by separating vehicular traffic lanes from the pedestrian space on the sidewalk. Many sidewalks on North Carolina roads are set at the back of the curb, thus there is no buffer from motor vehicle traffic. In other cases, the buffer is narrow. Buffer width should be determined on the context of the street. A commercial street in a downtown district may require a narrow buffer with good access to nearby shops, whereas a sidewalk along a thoroughfare or collector street adjacent to residential uses may warrant a wide landscaped buffer area to shield pedestrians from heavy traffic.
- Obstructions:** Items reducing the clear width for pedestrian travel along sidewalks affect sidewalk functionality. Utility poles are sometimes located within the clear width of sidewalks in North Carolina, reducing their functional width and causing them to be noncompliant with accessibility guidelines (Public Rights-of Way Accessibility Guidelines – PROWAG).
- Access to Transit:** Sidewalk connectivity in the proximity of bus stops provides access to these stops for all riders, and is especially important to older residents and those with disabilities. Many transit stops in North Carolina lack connecting sidewalks, forcing pedestrians to walk in the street or alongside the road in the grass to reach bus stops.



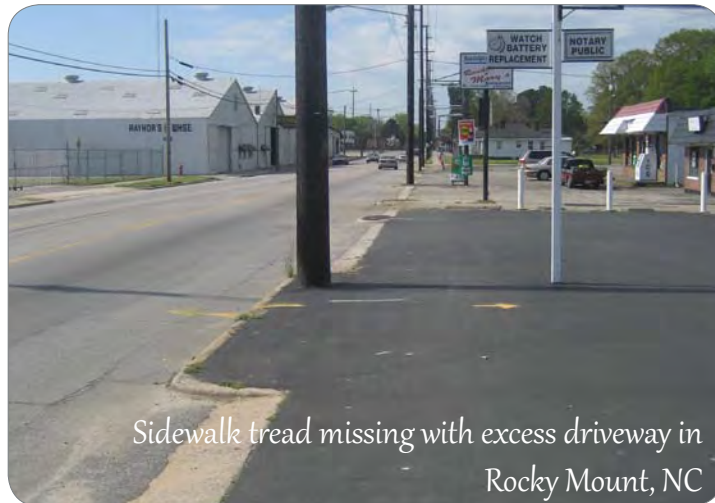
Power pole obstructing sidewalk in Columbia, NC



No sidewalk connections or amenities at bus stop in Rocky Mount, NC

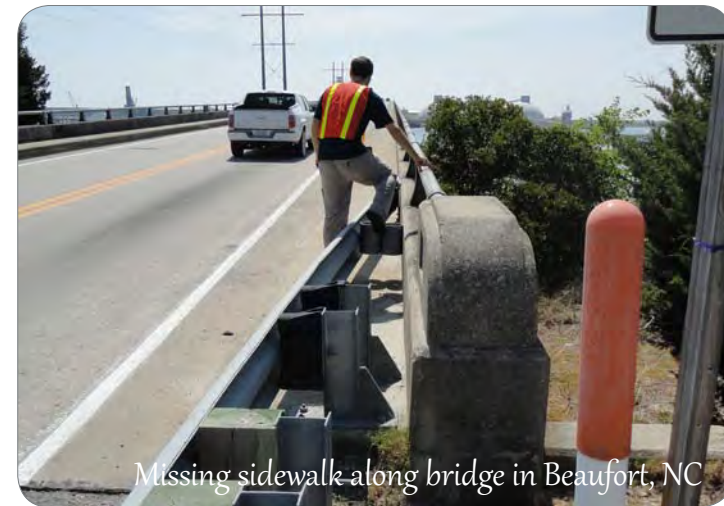
- Bus shelters:** Providing for a comfortable experience, for example by including shelters at bus stops, gives benefits to current transit users and encourages others to view public transit as a viable transportation alternative.

- **Driveway crossings:** Sidewalks in North Carolina are often interrupted by driveways. At these locations, the surface of the sidewalk may not carry across the driveway entrance, leaving the impression that the driver has the right-of-way, thus motorists often do not yield to pedestrians at these locations, as required by law.



- **Construction Zones:** Construction zones can range from complete sidewalk closure to fully protected access. In May 2008, NCDOT published a Guide for Temporary Pedestrian Accommodations, which addresses issues such as American's with Disabilities Act (ADA) accessibility, safety, and the identification of temporary detour routes.

- **Bridges:** Bridges can serve as either connections or barriers in the pedestrian network. Many bridges in North Carolina have no pedestrian accommodations, or the sidewalk extending across the bridge is very narrow and uncomfortable.



- **Greenways/Sidepaths:** Sidepaths and greenway trails provide safe, off-road facilities for both pedestrians and bicyclists. Sidepaths can typically be constructed within the roadway right-of-way, while greenway trails are more remote and occur in natural areas. In areas where pedestrian traffic volumes are heavy, sidepaths should be constructed instead of sidewalks.
- **Access to Trails:** A network of sidewalks is needed to provide access to multi-use trail entrances. North Carolina has an extensive trail network, but often these trails are not connected to destinations and neighborhoods because streets lack sidewalks.

Across the Roadway

- **Intersection Geometry:** Intersection geometry is a critical element affecting accessibility and pedestrian comfort crossing streets. Skewed intersections that result in obtuse angles (larger than 90 degrees) allow motorists to make right turns across the pedestrian travel way at higher speeds, while often interfering with pedestrians' ability to see turning traffic.



- **Crosswalks:** Crosswalk markings are used to alert motorists to locations where they should expect pedestrians and to identify a designated crossing location for pedestrians. A crosswalk may be marked or unmarked since, legally, crosswalks exist at all intersections, unless specifically prohibited.



- **Grade-Separated Crossings:** Pedestrian bridges and underpasses are needed in some locations (such as high-speed, multilane crossings) to separate pedestrian



traffic from motor vehicle traffic. This is a solution that should be used carefully, as these structures are very expensive. For example, if crossings require out-of-direction travel, pedestrians will often continue to cross at-grade. An example of a pedestrian bridge in North Carolina is the R. Kelly Bryant, Jr. Pedestrian Bridge over NC-147 in Durham, which links residential and commercial areas divided by the freeway, while also providing access to future transit and trail systems.

- **Curb Ramps:** ADA-compliant curb ramps ensure that the pedestrian network is accessible for all users and creates a more useful network for pedestrians traveling with strollers.



Curb ramps missing in Oxford, NC

- **Pedestrian Crossing Islands:** In locations with longer crossing distances (four or more lanes) and/or higher vehicle speeds, pedestrian crossing islands benefit pedestrians by providing a refuge. Pedestrian crossing islands have been shown to increase safety for pedestrians crossing multi-lane roadways at uncontrolled crossings, particularly on roads with more than 12,000 vehicles per day.



Lack of crossing facilities and median island in Columbia, NC

- **Curb Extensions:** In locations with on-street parking, curb extensions shorten the distance pedestrians must cross, while at the same time increasing their visibility to motorists. By narrowing the curb-to-curb width of a roadway, curb extensions help reduce motor vehicle speeds and improve pedestrian safety. This is a strategy that has been used in some cities and towns in North Carolina.

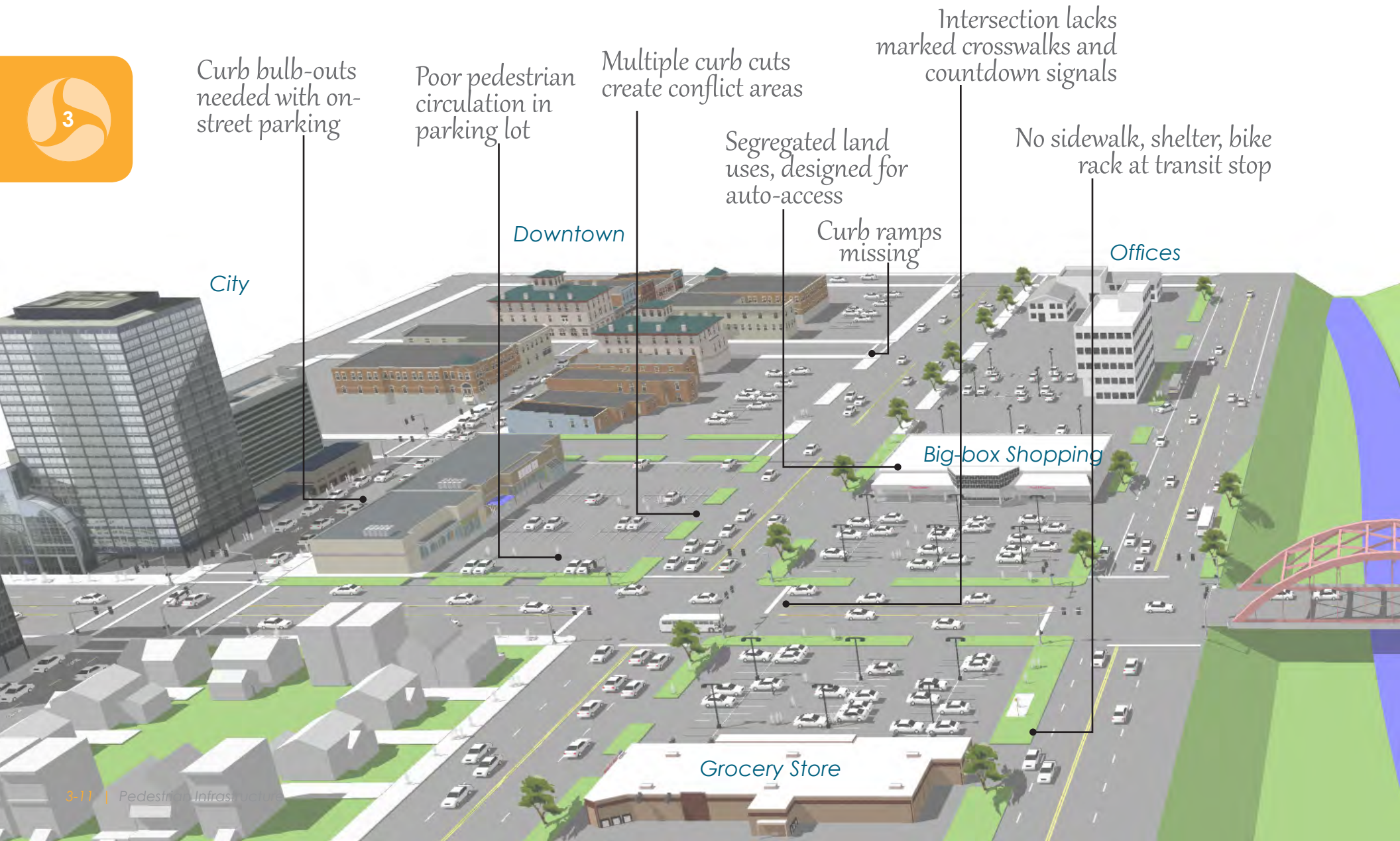


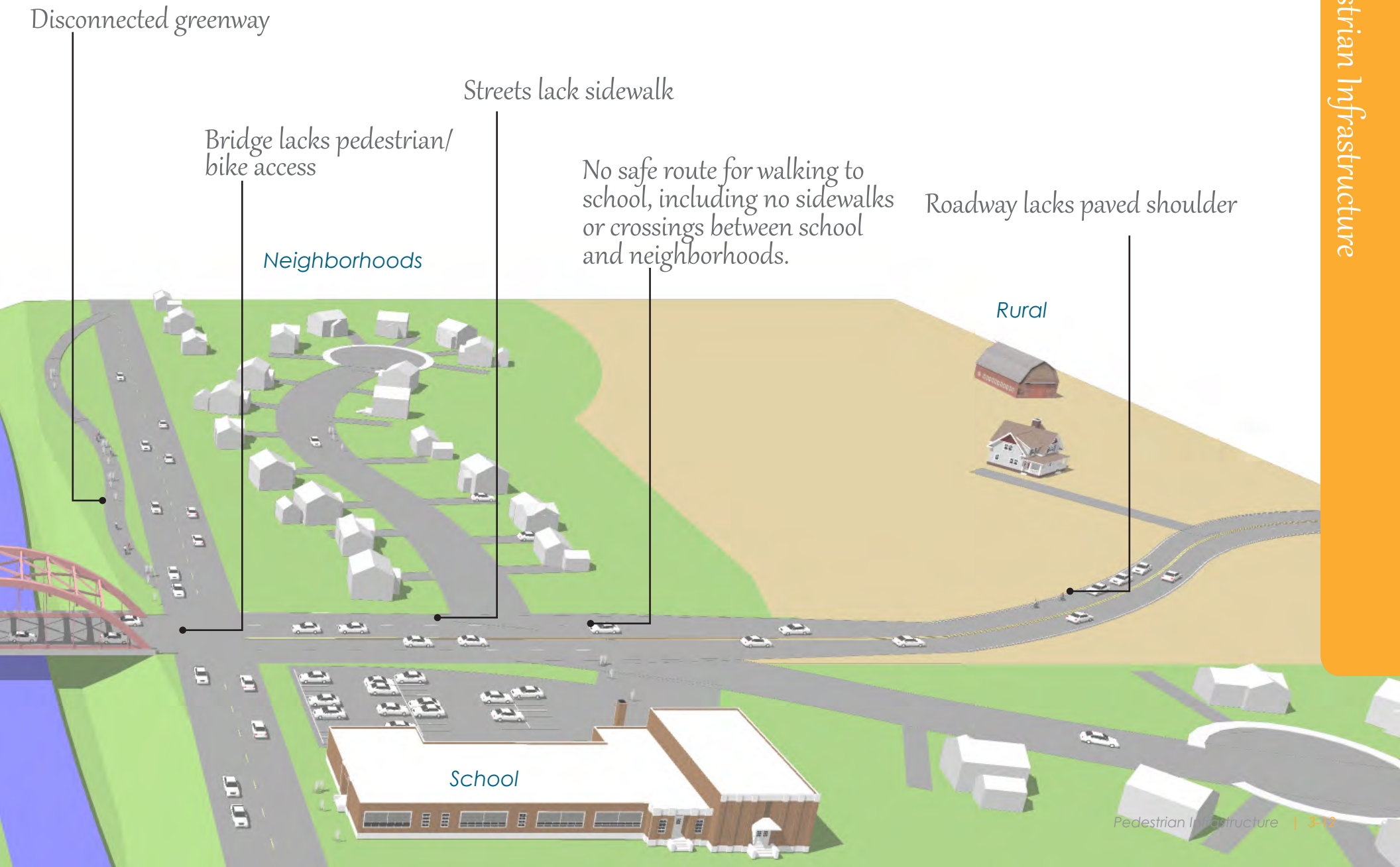
Absent curb extensions in Cherokee, NC

TRANSPORTATION CHOICES: WALKING vs. DRIVING IN NORTH CAROLINA

Draft Comments: www.surveymonkey.com/s/WalkBikeNC Draft

This graphic illustrates how most urban, suburban, and rural areas in North Carolina are designed primarily for the automobile. Driving an automobile is currently the most convenient mode of travel for many North Carolinians because our roadway network is designed for driving and our land uses tend to be segregated and separated by long distances, making walking from origin to destination challenging. North Carolina currently lacks a contiguous, interconnected and consistent network of pedestrian facilities and services that would encourage walking as a viable choice for transportation.





IMPROVING NORTH CAROLINA'S WALKING ENVIRONMENT

Draft Comments: www.surveymonkey.com/s/WalkBikeNC_Draft

This graphic illustrates how most urban, suburban, and rural areas in North Carolina can be retrofitted to better serve all of NCDOT's transportation 'customers'. In addition to the pedestrian project examples below, issues with land use and trip distances will also need to be addressed, mostly on the local and regional level. This could include a greater mix of land uses, higher densities of land use, infill development, and reinvestment in NC's downtown areas. Land use and development strategies such as these serve to not only reduce infrastructure costs and preserve open space, but they also shorten daily trip distances, making walking a more viable choice for everyday transportation.

City-center and downtown areas with street trees, bulb-outs, shared-lane bicycle markings, and high-visibility crosswalks.

Designated areas for pedestrian circulation in parking lot

Reduction in curb cuts to reduce conflict areas

Intersection with marked crosswalks and countdown signals

Higher density, mixed-use retrofit, designed for bike/ped access

Sidewalk, shelter, bike rack at transit stop

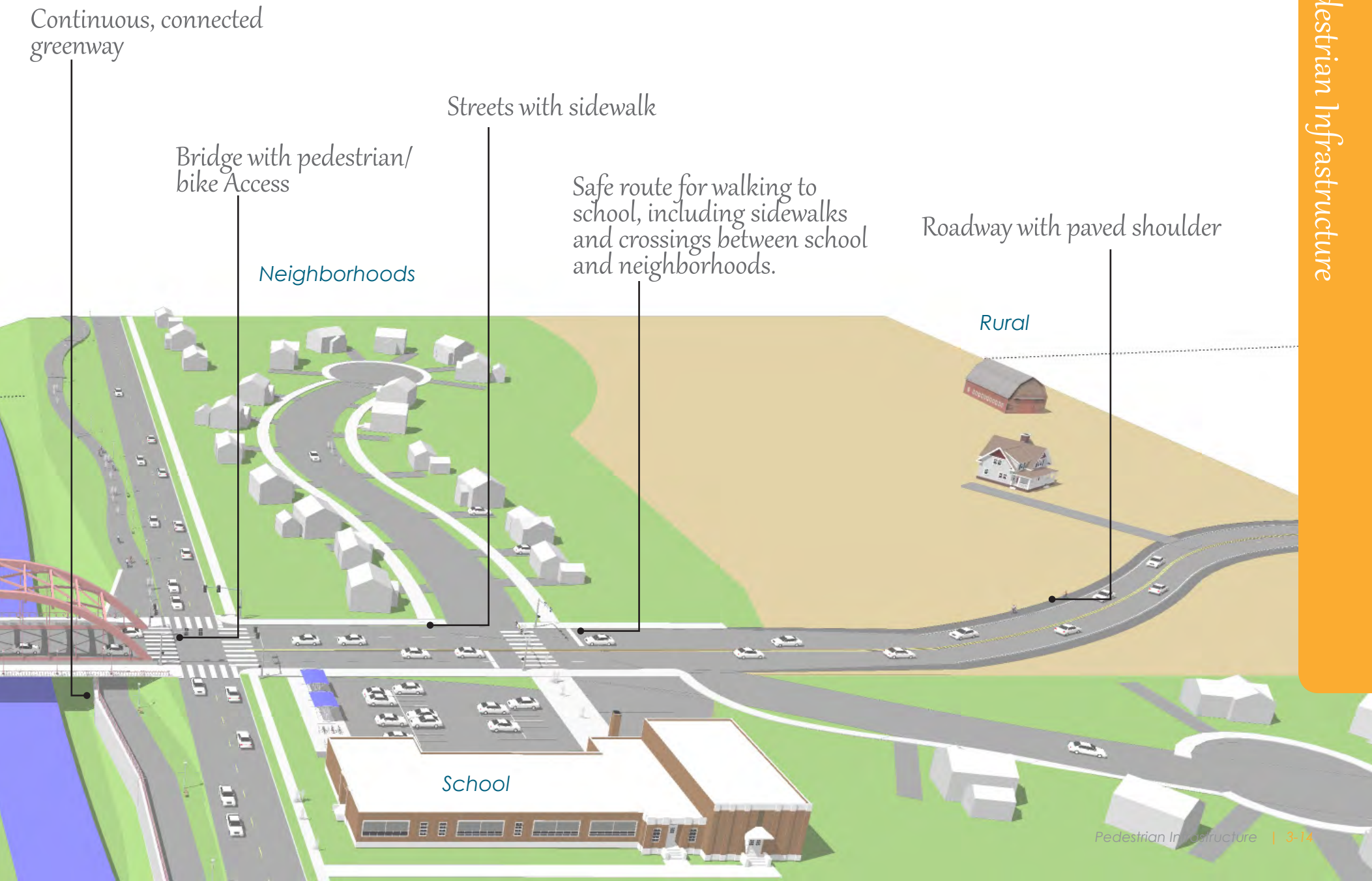
Downtown

Curb ramps

Offices

Mixed-Use Retrofit

Grocery Store





- Example of current conditions for pedestrians.



- Example improvements for pedestrians, including a connected and continuous greenway trail, high visibility marked crosswalks, sidewalks, bridge access, and pedestrian countdown signals.

Example of current conditions for pedestrians. ▶



Example of improvements for pedestrians, including street trees, high visibility marked crosswalks, and curb bulb-outs. Note the shared-lane markings for bicyclists as well. ▶



- **Pedestrian Countdown Signals:** Signals that indicate how much time is left before the light changes have proven to be effective at helping pedestrians avoid getting caught in the middle of a crosswalk when the signal changes. This is especially important on wider streets, of which there are many in North Carolina. NCDOT regularly installs pedestrian countdown signals.
- **Signal Design Strategies:** It is essential to provide signals that are phased and timed to allow pedestrians of all abilities to cross the roadway, including those who are typically slower (children, senior citizens, people with limited mobility). Ideally, pedestrians should be given a protected phase, so that there are no conflicting turn conflicts during the pedestrian “green” phase. In some cases where turning conflicts can’t be avoided (such as right turns), a Leading Pedestrian Interval (LPI) can help pedestrians establish their presence in the crosswalk prior to giving motor vehicles the “green” cycle. In general, there are many pedestrian-oriented signal design strategies that are not presently used on North Carolina roads.
- **Lighting:** Pedestrians can be adversely affected by low-light conditions. Two-thirds of pedestrian fatalities occur between dusk and dawn. Lighting is important at intersections and uncontrolled crossings, particularly in locations near transit stops. In addition, pedestrian scale lighting is needed along sidewalks to avoid pools of darkness that are common between street lamps that are primarily oriented to motor vehicle travel.

The pedestrian environment is shaped by physical infrastructure, which is developed and maintained by both public and private stakeholders in North Carolina. The current process for funding and constructing pedestrian facilities is described below.

CURRENT PROCESS FOR FUNDING AND CONSTRUCTING PEDESTRIAN FACILITIES

Pedestrian facilities are planned, designed, and built by municipalities, private developers, NCDOT, and others in North Carolina. Cities and towns throughout the state fund their own streetscape improvement projects. For example, the City of Charlotte’s Sidewalk Retrofit Policy provides ongoing funding for the construction of new sidewalk and maintenance of the existing sidewalk network. In order to apply the funds where they are most needed, new sidewalk construction projects are prioritized in accordance with the city’s Sidewalk Retrofit Policy. Charlotte also constructs pedestrian facilities as part of major roadway projects through its Thoroughfare and Street Projects program.

Private developers are also a major contributor of pedestrian facilities, most notably sidewalks. These improvements are determined by local zoning and subdivision requirements. Existing codes and standards regulate the infrastructure that both public and private entities construct so it is critical that these local requirements are consistent with complete streets principles such that they create a built environment that equally meets the needs of pedestrians, bicyclists, motorists, and transit users.

Within NCDOT, most construction of pedestrian facilities occurs at the local or Transportation Division level. The current statewide allocation for small scale pedestrian improvements is divided among the state’s fourteen highway divisions. In addition to state funding, the Department sets aside federal funds from eligible categories for the construction of pedestrian transportation facilities.

Pedestrian infrastructure is currently implemented as a part of larger street or highway projects in North Carolina. Broadly speaking, there are two types of pedestrian infrastructure projects, independent and incidental. Independent projects are those where pedestrian facilities comprise the entire project. These projects are planned by municipalities based on a perceived local need and submitted to the local MPO or RPO, which then prioritizes all projects received. Based on this prioritization, NCDOT implements as



▲ Mid-block crossing construction in Charlotte, NC

many projects as funding allows. Independent projects are prioritized, funded and constructed separately from the standard project development process.

Incidental projects are those included as a part of a larger street or highway project. These projects have been identified through the “Policies to Projects” process that begins with long-range goals and investment decisions and ends with a detailed work program that spells out specific projects needed to achieve the goals. The process begins with the 30-year Statewide Long-Range Plan and ends with the 5-year Work Program. These plans and programs are summarized below.

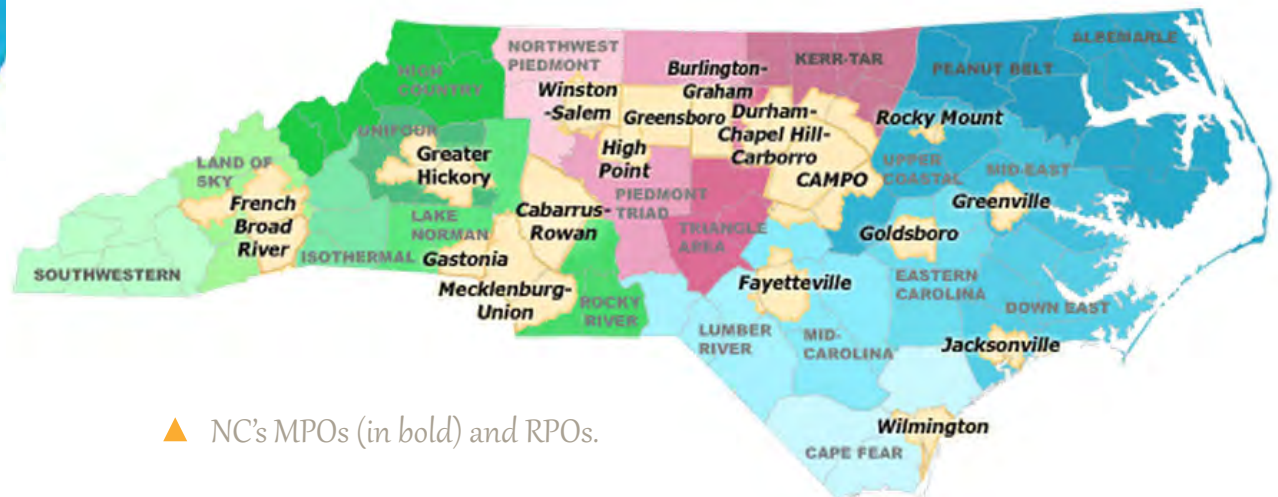
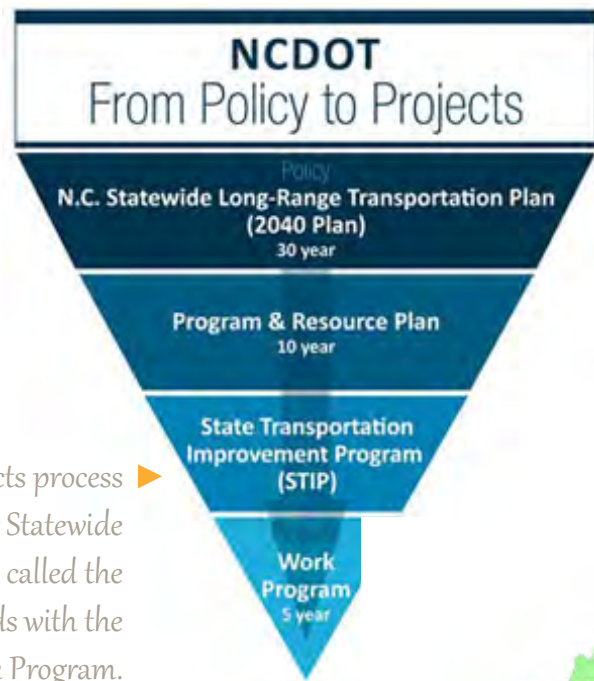
- **Statewide Long-Range Transportation Plan:** The *Statewide Long-Range Plan*, also known as the 2040 Plan, serves as a blueprint for transportation planning and investment over the next thirty years. The 2040 Plan focuses on the policies and programs that are needed to enhance safety, improve mobility and reduce congestion, as well as address all modes of transportation. The plan includes information on pedestrian transportation, including long-range investment needs and level of service targets.

- **Program and Resource Plan:** The Program and Resource Plan is a 10-year project list that addresses transportation needs identified through long-range planning. Potential projects are prioritized by staff from NCDOT, MPOs and RPOs with the goals of improving safety, mobility and infrastructure health based on crash data, congestion levels, pavement conditions, and other criteria. Pedestrian transportation is included

as part of the mobility and safety goal in the plan, and funds are programmed for pedestrian projects at the sub-regional level (may also occur as incidental project as part of statewide or regional tier).

- **State Transportation Improvement Program:** NCDOT publishes a federally required State Transportation Improvement Program (STIP) that is a seven-year subset of the Ten-year Project List. The STIP also includes smaller projects, called division-managed construction projects. The STIP describes the projects to be programmed in the next seven years. It is reviewed annually and updated every two years. The STIP includes independent and incidental pedestrian projects. For example, funds are set aside annually for pedestrian hazard elimination projects in all of the divisions across the state and the Division of Bicycle and Pedestrian Transportation (DBPT) receives funding for projects such as training workshops, pedestrian safety and research projects, and other pedestrian needs statewide. DBPT also administers funds for independent pedestrian infrastructure projects. Additionally, sidewalks, intersection improvements, and pedestrian-safe bridge

The Policy to Projects process begins with the 30-year Statewide Long-Range Plan (also called the '2040 Plan') and ends with the 5-year Work Program.



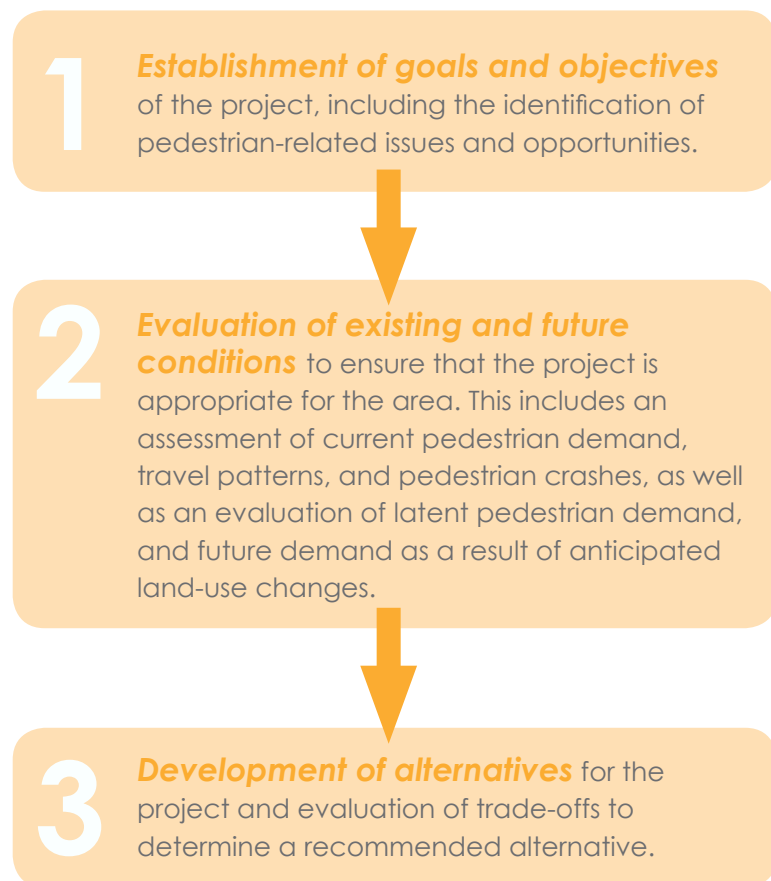
▲ NC's MPOs (in bold) and RPOs.

designs are frequently included as incidental features of highway projects.

- Metropolitan Transportation Improvement Program (MTIP):** The MTIP is the MPO corollary of the STIP, providing a seven-year forecast of all transportation projects in the Metropolitan Area Boundary. There are currently 18 MPOs in North Carolina (the newest being New Bern as a result of the 2010 U.S. Census estimate). Notably, seven of these MPOs are Transportation Management Authorities, or TMAs. These TMAs receive not only planning monies directly through the federal government that can be used for planning and conceptual design of pedestrian/bicycle projects and programs, but also an additional sum of money equivalent to 10% of the Surface Transportation Program funds that can be used for planning, design, right-of-way acquisition and construction of pedestrian and bicycle projects.
- Five Year Work Program:** The Work Program derives from the Program and Resource Plan. It contains both program and project-level information. The Work Program is an accounting of the state's annual transportation program grouped into Construction & Engineering, Maintenance, Operations, Administration and Transfers. The Work Program is NCDOT's commitment to the projects and services planned for the next five years. Work Program projects are found in the first five years of the (10 year) Project List. The Five Year Work Program is produced and reviewed by the Board of Transportation every year. The first two years of the Work Program are aligned with the biennial budget cycle. The work program includes specific pedestrian projects throughout the state, including sidewalks, trails, transit accommodations, and pedestrian tunnels.

Project Development Process

Once a project is defined and prioritized through the planning processes described above, it moves into the project development process. It is during this stage that the final design of projects is determined. The first step in the project development process is the formation of a design input team. The design input team includes internal NCDOT team members and external team members who work to ensure that all users are considered. The current project development process includes the following steps:





▲ NCDOT Ped/Bike Project Construction.

The final recommended alternative reflects the ultimate design for the project, including project-specific features and dimensions. Given the Complete Streets policy, the project development process outlined above should generally lead to the inclusion of pedestrian facilities; however, this is not always the case. If a pedestrian facility is not included in a planned project but a municipality believes that it should be, currently the municipality is required to notify NCDOT and request inclusion of the facility. NCDOT's Pedestrian Policy Guidelines outline the current process for a municipality to request inclusion of incidental pedestrian facilities in a proposed project.

If this process is followed and the pedestrian facilities are approved by NCDOT, local cost sharing is required for most projects based on a sliding scale, ranging from a 50/50 split for larger cities to an 80/20 split for smaller communities. If a municipality misses the window to request inclusion of pedestrian facilities, the facility may still be requested if the municipality agrees to cover the full cost.

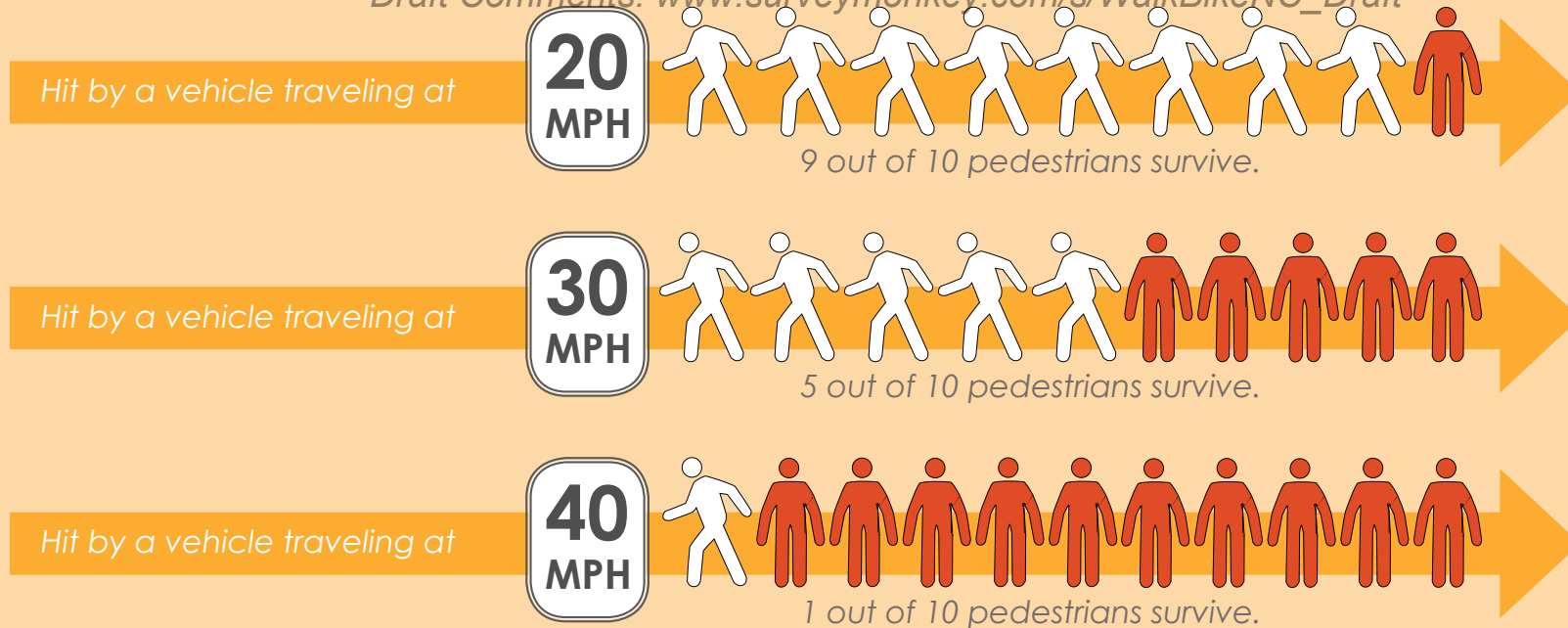
RECOMMENDATIONS

NCDOT's Complete Streets Policy emphasizes that the agency is committed to "providing an efficient multi-modal transportation network in North Carolina such that the access, mobility, and safety needs of motorists, transit users, pedestrians, and bicyclists of all ages and abilities are safely accommodated." The *Complete Streets Design Guidelines*, published in 2012, informs the design and implementation of complete streets elements as part of all ongoing and upcoming projects. The recommendations below, in addition to the design policy recommendations found in the Policy chapter of this document and the Pedestrian & Bicycle Toolbox in Chapter 6, will serve as the next steps in the state's efforts to improve pedestrian conditions. The recommendations below include pedestrian-related policy, design, and process elements.

1. Safety and Data Analysis

Issue: NCDOT collects and analyzes pedestrian and bike crash data on an ongoing basis. The agency's crash-data related efforts are a model for other state Departments of Transportation. For example, NCDOT has fourteen years of crash data that are categorized into crash types. The data contain linked variables and web-based query functionality. These data inform some budgeting and project programming decisions, although this link could be improved. The University of North Carolina Highway Safety Research Center is a national leader in developing pedestrian crash data analysis tools and countermeasures, and has assisted NCDOT over the years to design and populate this robust crash data system. However, in many cases, pedestrian and bicycle crash data are reported incorrectly or incompletely by law enforcement. Also, countermeasures are often implemented in a reactive manner only after a pedestrian death or rash of crashes.

Draft Comments: www.surveymonkey.com/s/WalkBikeNC_Draft



Speed Kills

The National Highway Traffic Safety Administration (NHTSA) has determined that excessive speeding is a factor in nearly one-third of all traffic fatalities and that the most dangerous roads are those with posted speed limits of 60 mph or higher. Speeding in residential areas is also a major cause of bicycle and pedestrian fatalities – chances of survival if hit by a vehicle traveling at 20 mph are 95 percent, yet drop to 50 percent at 30 mph and just 15 percent at 40 mph. For more information see:

Adapted from "Killing Speed and Saving Lives", UK Dept. of Transportation, London, England

Policy Direction: NCDOT should continue to serve as a national leader in the collection and analysis of pedestrian and bicycle crash data. The agency should continue to use crash data to prioritize investments, through independent and routine accommodations.

NCDOT should move forward with two distinct, but equally important, sets of actions: 1) Use data and research to proactively prevent pedestrian crashes, and 2) Improve crash reporting/data and use of information to prioritize future infrastructure investments.

Action Items/Proactive Safety Strategies:

A. Implement "Complete Streets" approach consistently

with all roadway projects to ensure a connected, accessible, and safe pedestrian network.

- B. Develop strategy to advertise and educate NCDOT Division staff, MPOs/RPOs, cities, counties, advocates, and law enforcement staff across the State about HSRC crash analysis and data and trends in North Carolina. As part of this, consider developing a mapping application available on DBPT's website to show crash information.
- C. Maintain the Safety & Mobility safety audit team to review roadway improvement plans in high crash locations. This team should be proactive utilizing pedestrian/bicycle crash data regularly. One important element of this work is to evaluate crash data

Table 3.4 Pedestrian Crash Reduction Factors

Design Treatment / Intervention	Crash Reduction Rate
Provide a minimum 4' paved shoulder to avoid walking along roadway	71% (pedestrian crashes)
Increase enforcement to reduce speed	70% (pedestrian crashes)
Install sidewalk to avoid walking along roadway	65-89% (pedestrian crashes)
Install pedestrian refuge islands	56% (pedestrian crashes)
Install raised median + crosswalk	46% (pedestrian crashes)
Improve lighting at intersections	42% (pedestrian injury crashes)
Add exclusive pedestrian phasing to signalized intersection	34% (pedestrian crashes)
Restrict parking near intersections	30% (pedestrian crashes)
Convert unsignalized intersection to roundabout	27% (pedestrian crashes)
Improve/Install pedestrian crossing	25% (pedestrian crashes)
Install pedestrian countdown signal heads	25% (pedestrian fatal/injury crashes)
Increase enforcement related to motorist yielding in marked crosswalks + public education campaign	23% (pedestrian crashes)
Install pedestrian overpass/underpass at unsignalized intersection	13% (pedestrian crashes)

Source: Federal Highway Administration. Desktop Reference for Crash Reduction Factors. <http://safety.fhwa.dot.gov/>

and identify potential conflicts within a proposed project area.

- D. Continue successful pedestrian/bicycle safety reviews conducted by the Traffic Safety Unit (examples: Fayetteville and the Outer Banks (US 158) in areas of safety concern.
- E. Develop an injury minimization approach for setting speed limits on new roadways and major roadway reconstruction projects. The approach should identify the intended operational speed at the outset of a project based on the context and local preferences, and then design the road to ensure that higher speeds are uncomfortable for drivers.¹
- F. Evaluate facilities and programs for their capability to improve motorist/pedestrian/bicyclist compliance and safety. Utilize national studies and FHWA crash reduction factors shown in following table to support design solutions for safety improvement (see Chapter 6 - Pedestrian & Bicycle Toolbox).
- G. Implement education, encouragement, and enforcement programs as detailed in Chapter 7.
- H. Engage more stakeholders in a comprehensive approach to improving safety for pedestrians. Hold Pedestrian and Bicycle Safety Summits every two years to discuss new trends and evaluate progress.

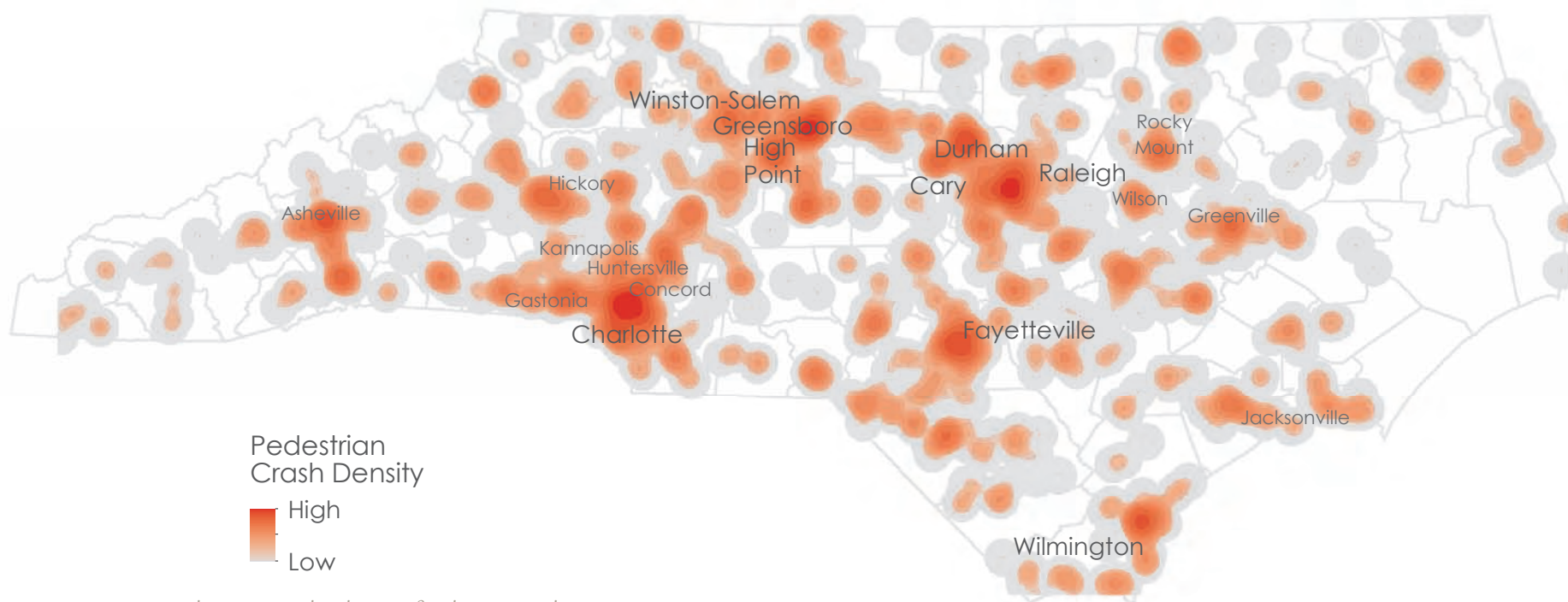
Action Items to Improve Safety Data:

- A. Continue to explore ways to improve the quality and completeness of pedestrian crash data, including working with municipalities, hospital systems/emergency

¹ See the FHWA report, *Methods and Practices for Setting Speed Limits: An Informational Report* (FHWA-SA-12-004)

2010 Pedestrian Crash Density Map, NC

Source: 2010 NCDOT Crash Data*



*Map shows geographic density of pedestrian crashes in 2010

response, law enforcement, HSRC, and MPOs/RPOs to more consistently and accurately record crash events and to share data. The STRUCK study in New Hanover County is one new approach to this collaboration and analysis.

- As part of increased engagement as suggested above, establish a Statewide Pedestrian and Bicycle Safety Consortium to develop consistent, thorough recording of crashes that will allow for more comprehensive, consistent databases. The Consortium could also support WatchForMeNC program.

- Evaluate the existing Highway Safety Improvement Program (HSIP) prioritization and project programming process and adjust as needed to ensure HSIP funds are distributed proportionately to the percentage of pedestrian and bicycle fatalities in the state.
- Incorporate ongoing HSRC crash geocoding efforts into decision-making and prioritization.
- Conduct studies to isolate high pedestrian and bicycle crash locations and coordinate results with the HSIP process to provide pedestrian countermeasures in these locations.

The agency should explore the development of a model to estimate pedestrian and bicyclist volumes, with the purpose of developing better prioritization methods that account for crash rates in addition to crash frequency. If possible, the model should be compatible and/or coordinated with analytical models currently used by other state agencies.

2. Transit Access

Issue: Existing transit-related policies do not fully account for the critical link between transit and pedestrian and bicycle transportation. Some NCDOT policies make it difficult to improve pedestrian access to transit. It is critical that transit access facilities maintain safety for all roadway users, including pedestrians and bicyclists.

Policy Direction: Strong pedestrian connections to transit stops and stations are integral to the success of North Carolina's transit systems. NCDOT should reassess policies with an eye toward ensuring roadways and transit stations/stops are accessible, attractive to pedestrians, and safe.

Action Items

- A. Ensure clear/breakaway zone policies allow transit amenities including signage, benches, shelters, bike racks and other items at urban, suburban and rural transit stops in a way that maintains safety for all users.
- B. Conduct transit access studies (using the Durham Transit Access Study as a guide) in other parts of the State to determine key local issues that need to be addressed, and to open a dialogue about transit access with local agencies. These studies should focus on connectivity to transit stops and demonstrate how a typical transit stop/station site plan should be done to ease pedestrian and bicycle access.
- C. Clarify policies with regard to ADA-compliant transit

stops to ensure the stop itself is compliant, but also to provide an accessible and safe path of travel to sidewalks and intersections in the vicinity of the stop. Policies should also address the pros and cons of near-side versus far-side transit stops, and provide methods to accommodate necessary pedestrian crossings of wide streets at controlled and uncontrolled locations to access transit stops on the other side of the street.

- D. Per the recommendations for the Roadway Design Manual (RDM), provide detailed design guidance for the placement of benches and shelters, as well as bike parking associated with longer term transit facilities such as park-and-ride lots.
- E. Improve communication between DBPT and Public Transportation Division to ensure meeting of pedestrian/bicyclist/transit customers needs.

3. ADA Transition Plan

Issue: NCDOT's Americans with Disabilities Act (ADA) Transition Plan is limited in scope and does not fully address the US Access Board's *Public Rights-of-Way Accessibility Guidelines* (PROWAG).

Policy Direction: Update Departmental policies to reflect current best practices and prepare for the issuance of forthcoming guidance (PROWAG).

Action Items:

- A. Adopt the U.S. Access Board's Draft PROWAG and incorporate the guidelines into the new RDM and all roadway design projects. This should include guidelines for accessibility in work zones.²

² Minnesota Department of Transportation has developed best practices for pedestrian accessibility in work zones.



▲ Retrofitting for curb ramps is an important part of an ADA transition plan. Photo: Salisbury, NC (Permission needed from Salisbury Post)

- B. Prepare a Transition Plan for State-Owned Public Right-of-Way in North Carolina, and develop a monitoring program for ongoing self-evaluation. This should include a GIS inventory and evaluation of sidewalks, signals and crossings. It should identify routine inclusion of curb ramp retrofits during road resurfacing projects, and prioritize projects needed to bring existing pedestrian facilities into compliance with PROWAG.³
- C. Conduct staff training on the new PROWAG. This should include an initial round of training for staff in the central and division offices, as well as periodic follow-

³ The Maryland State Highway Administration (SHA) provides a best practice in this regard. The location of sidewalks on state roadways is mapped in GIS, along with the width of the facility and compliance with the Americans with Disabilities Act (ADA). Pedestrian improvements are prioritized based on ADA compliance and access to transit. The data that have been collected aid in selecting these projects.

up training for new staff.

- D. Update the Transition Plan described above on a two-year cycle.
- E. NCDOT should require that all divisions develop an ADA Transition Plan.

4. Safe Routes to School Infrastructure

Issue: Safe Routes to School (SRTS) is an international movement that encourages and enables children to walk and bicycle to school. The federal SRTS program has provided funding that has been used for the “planning, design, and construction of infrastructure-related projects that will substantially improve the ability of students to walk and bicycle to school, on any public road or any pedestrian or bicycle pathway or trail within approximately 2 miles of a primary or middle school.” Funds can also be used for “non-infrastructure related activities to encourage walking and bicycling to school, including public awareness campaigns and outreach to the press and various community leaders, traffic education and enforcement, student training, and funding for training, volunteers, and managers of SRTS programs.”

SRTS is an eligible program under MAP-21 Transportation Alternatives Program. Also, remaining SRTS funds from SAFETEA-LU are still eligible for projects under those guidelines. However, under MAP-21, SRTS is now considered optional for each state. SRTS coordinators are not required under MAP-21 as under SAFETEA-LU.

SRTS is a key program of DBPT and has successfully funded infrastructure, non-infrastructure, and planning projects across North Carolina. In 2013, a new SRTS program is being launched through a collaboration between DBPT and the Department of Health and Human Services (DHHS).

This effort will place one regional SRTS coordinator for every ten counties of North Carolina to be stationed with DHHS staff to help communities address important policy topics like school siting, and help educate communities, promote engineering, education, encouragement, and enforcement programs.

Policy Direction: NCDOT should continue to support SRTS efforts within DBPT under new MAP-21 legislation. By doing so, NCDOT may continue serving as a national leader in the SRTS movement. The agency should utilize 100% of existing funds and 100% of new, eligible funds from MAP-21 to support a continuation of infrastructure and non-infrastructure projects that make walking and biking to school safer.

Action Items

- A. Expand the Safe Routes to School program. The existing SRTS program should be expanded to reach more of North Carolina's schools. A North Carolina SRTS website should be developed to advertise the program, highlight success stories, and build awareness.
- B. Use existing funds (remaining from SAFETEA-LU) to fund additional rounds of infrastructure, non-infrastructure, and action planning grants around North Carolina.
- C. Maintain Safe Routes to School staffing as part of the Division of Bicycle and Pedestrian Transportation.
- D. Initiate a new public health collaboration with DHHS/Community Transformation Grant in order to reach more communities and schools around the State. As part of this collaboration, engage Department of Commerce, Board of Education, Department of Public Instruction, and DHHS. Evaluate the program immediately to document successes and opportunities for improvement.

- E. Explore ways to simplify and streamline SRTS grant and implementation processes.

5. GIS Data Standardization for Pedestrian Facilities

Issue: GIS data files describing pedestrian facilities are generated by many different individuals and organizations. Data are created for each plan funded through the planning grant program. However, formats vary significantly depending on the individual consultant and municipality completing the work. Further, many individual towns and cities create and maintain their own GIS datasets, which also vary widely in format and level of detail. The wide variation in data format makes data transfer and coordination difficult, and hinders regional efforts to catalog existing pedestrian facilities.

Policy Direction: NCDOT should adopt a GIS framework covering both pedestrian and bicycle datasets that clearly defines the attributes to be inventoried and an associated nomenclature for each attribute. This framework should be mandatory for data created through the Planning Grant Initiative and the Comprehensive Transportation Planning process.

Action Items

- A. Evaluate the framework developed by ITRE and enhanced through this planning process and revise and/or expand as needed. The framework is detailed in the following tables.
- B. Meet with GIS staff from selected major municipalities to review the draft framework in comparison to their current data formats. Modify as necessary to ensure the framework will meet the needs of local governments.
- C. Once finalized, train Bicycle & Pedestrian Division staff



on this framework and direct them to ensure its use during each planning process.

- D. Provide online mapping application for viewing pedestrian and bicycle routes and facilities for officials and public.
- E. Distribute the framework to municipalities around the state and encourage them to generate and maintain data in this format going forward.
- F. Re-evaluate attributes and nomenclature bi-annually and update to incorporate new facilities as they are developed.

6. GIS Data Transfer and Data Maintenance

Issue: Outside of the Bicycle & Pedestrian Division, GIS data covering pedestrian and bicycle facilities are used in two other areas of NCDOT: the Transportation Planning Branch and the Strategic Prioritization Process. While data are currently provided by the Bicycle & Pedestrian Division to the Transportation Planning Branch for incorporation into Comprehensive Transportation Plans, and later to the GIS staff involved in the prioritization process, it comes in a piecemeal format and can be difficult to use.

Policy Direction: Two previous policy recommendations will partially address this issue. The data format framework above will ensure that all data are consistent and therefore easy to merge, and modifications to the format used for pedestrian and bicycle components of Comprehensive Transportation Plans will make these plans more consistent with standalone pedestrian and bicycle plans. To further support smooth transfer of data between agencies within the DOT, one central database should be maintained exclusively for pedestrian and bicycle data and updated every time a pedestrian plan, bicycle plan, or comprehensive transportation plan is completed.

Table 3.5 Recommended Format for Linear Pedestrian GIS Layers

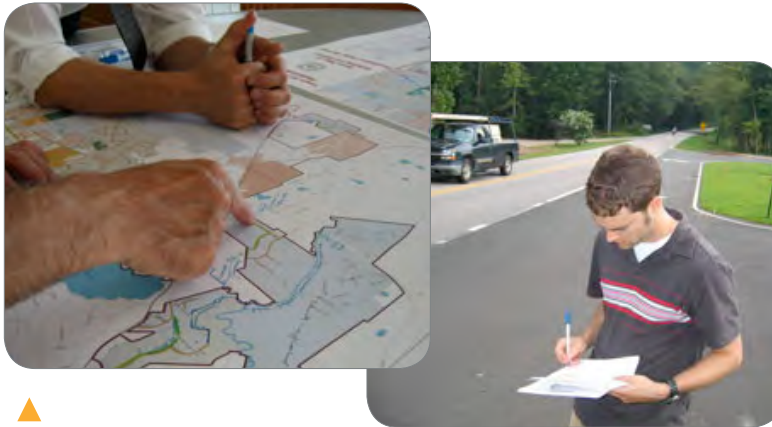
Attribute	Possible Entries
Jurisdiction	Municipality or County
Roadway Ownership	Municipality or NCDOT
Last Update	
Existing Facility	Sidewalk, Multi-Use Path
ADA Compliant	1/0
Condition	Good, Fair, Poor
Characteristics	Ex: Debris, many driveways
Width	
Buffer Width	
Material	Asphalt, Concrete, Gravel, Brick, Natural
Proposed Facility	Sidewalk, Multi-Use Path, ADA Improvement, Resurface
Proposed Project	New Construction, Traffic Calming, Widening

Table 3.6 Recommended Format for Point Pedestrian GIS Layers

Attribute	Possible Entries
Crosswalks	Existing, Needs Improvement, Proposed
Median Islands	Existing, Needs Improvement, Proposed
Ramps	Existing, Needs Improvement, Proposed
Signals	Existing, Needs Improvement, Proposed
Characteristics	Other

Action Items

- A. Modify existing datasets to match the selected framework, leaving gaps where they exist, and merge into one master database. The database should include locally-owned roadways.
- B. Assign staff resources to manage and maintain the comprehensive pedestrian & bicycle database.
- C. Communicate the existence and goals of the database with local GIS staff around the state.
- D. Set up a process by which data is exported from the master database for each pedestrian plan, bicycle plan, or comprehensive transportation plan, and data updates made during these plans are then added to the database at the end of each planning process (web-based process should be considered)
- E. Make built environment/GIS data available to DHHS and researchers for their analysis of health impacts.



A central database should be maintained and updated every time a pedestrian plan, bicycle plan, or comprehensive transportation plan is completed.

7. Main Street Program (Department of Commerce)

Issue: The N.C. Main Street Program is part of the Office of Urban Development in the North Carolina Department of Commerce. The program assists selected communities across the state in restoring economic vitality to their historic downtowns. The Main Street Four-Point Approach is a comprehensive revitalization process designed to improve all aspects of a downtown, producing both intangible and tangible benefits. The four elements are: organization, promotion, design, and economic restructuring. While pedestrian, bicycle, and Complete Streets elements have become parts of the design element, they are not explicitly part of the Main Street Program. An opportunity exists for collaboration between the Department of Commerce and NCDOT.

Policy Direction: The Department of Commerce should work with NCDOT to expand the Main Street Program to include a Complete Streets element.

Action Items

- A. Establish the Main Street Program as a collaboration, involving NCDOT more thoroughly in future projects to address Complete Streets transportation elements of projects. These projects can also serve pedestrian and bicycle connectivity to the Downtown from surrounding communities.
- B. NCDOT should work jointly with the Department of Commerce. These projects serve as an opportunity for pilot projects for Complete Streets implementation.
- C. The Department of Commerce should continue partnering with state agencies (through the Healthy Environments Collaborative) along with local health

departments and walking/biking groups as part of the Main Street Program.

- D. The Department of Commerce should update its design element of the Main Street Program to include language about “Complete Streets.”
- E. NCDOT should communicate with and provide educational opportunities for Department of Commerce staff regarding Complete Streets and its health and economic benefits. One opportunity is presenting at the annual Commerce meeting.



- ▲ The Town of Clayton is one of many Main Street Program successes. Among recent projects, they designed and built an all-brick walkway to the Civil War Trails marker. Photo: <http://downtownclayton.blogspot.com/>

8. Small Town Economic Prosperity program (STEP)

Issue: The North Carolina Small Town Economic Prosperity program (NC STEP) was established in Spring 2006 to aid in the economic revitalization component of the state's small towns initiative. The STEP program takes a four-step comprehensive process to aid participating towns in revitalizing their economy, from preliminary evaluations and recommendations to staff trainings to project and program implementation. The four elements of the program are: coaching assistance, training scholarships, planning grants and project implementation grants. The STEP program provides extensive context-sensitive guidance and coaching to towns, but does not specifically address transportation needs, nor draw on the expertise of NCDOT. A valuable opportunity exists to guide towns in the implementation of Complete Streets as a tool in economic revitalization.

Policy Direction: The NC Rural Economic Development Center should work with NCDOT to expand the STEP program to include the infrastructure and programmatic needs of bicycles and pedestrians as an effective approach to aid in the economic revitalization of participating towns.

Action Items:

- A. Incorporate technical workshops and training sessions on integrating bicycle and pedestrian accommodations into a town's transportation network into the training element of STEP.
- B. Incorporate an NCDOT presence in the coaching phase of STEP. This DOT partnership will educate towns about the far-reaching benefits and relatively low costs of bike/ped projects and programs, citing the striking

economic benefits noted in other rural regions of North Carolina.

- C. Include a town staff member from the transportation department onto the community's leadership team. This is the team of community leaders that is formed during the application process and continues to attend workshops and trainings throughout the STEP process.
- D. Identify grant opportunities specifically for the planning and implementation of Complete Streets to jump start the revitalization of Main Street

9. Community Transformation Grant (CTG)

Issue: The North Carolina Division of Public Health received \$7.4 million as a part of the Department of Health and Human Services (DHHS) Community Transformation Grant. This funding is allotted to be used throughout the state to expand efforts in promoting tobacco-free living, active living and healthy eating, and quality clinical and other preventive services. These initiatives describe the efforts made to engage partners in various sectors including education, transportation and business. However, given the goal of improving health through active living, the role and relationship with DOT is not explicitly explored or identified. There is a great opportunity to formalize the relationship and cooperation across agencies, including NCDOT and DBPT, for the betterment of participating communities.

Policy Direction: Ensure that NCDOT is not only present, but serves as a key player from start to end of the community-level health intervention process, beginning with the design all the way to the implementation and evaluation of projects.

Action Item:

- A. Provide awarded communities with technical assistance provided by NCDOT to ensure that physical activity is made safer and more accessible through bicycle and pedestrian projects that are in line with the expertise of transportation professionals.
- B. Add to "Strategic Direction II A: Active Living" an explicit mention of the incorporation of bicycle and pedestrian projects as a sub-goal for this effort.
- C. The CTG program is led by the Health Department, thus CTG coordinators and staff members come primarily from health-focused backgrounds. Create an additional position for a transportation professional, or properly train coordinators with the necessary skill set to guide community's in the implementation of bicycle and pedestrian projects.

10. North Carolina Parks and Recreation Trust Fund (PARTF)

Issue: PARTF is a state grant for local governments, received by Department of Environment and Natural Resources (DENR), formed in 1994 to fund improvements in the state's park system, fund grants for local governments and increase the public's access to the state's beaches. This is the primary funding source to build and renovate facilities in parks and buy land for new and existing parks. NC Parks and Recreation provides technical assistance through a contract with the Recreation Resource Service, but transportation-related technical assistance is not offered. Communities are eligible to receive funding for capital improvement projects such as bicycle and pedestrian access accommodations and trails through



PARTF. This inclusion of transportation projects in the funding delegation should be accompanied by technical assistance or guidance from NCDOT and DBPT.

Policy Direction: NCDENR should work in partnership with NCDOT to both select grant recipients and aid communities in providing bicycle and pedestrian facilities for safe access to parks and recreation within parks.

Action Items:

- A. The scoring metric to determine grant recipients should include a greater emphasis on promoting active living as it is described in the application. Scoring should also specifically consider plans for projects that aim to achieve safe access and use by bicyclists and pedestrians.
- B. NCDOT should provide funding and support to work jointly with the Department of Environment and Natural Resources. PARTF should further emphasize the importance of bicycle and pedestrian facilities as it works toward the goal of promoting active living as a part of the state park system.
- C. NCDOT should provide training and technical expertise to DENR throughout the process, including in the description of the grant-funded projects, the application process, scoring and selection, and implementation.
- D. The 15-member Parks and Recreation Authority is charged with the duties of allocating funds for land acquisition, allocating funds for capital projects, soliciting financial and material support, and developing effective support for parks and recreation. Thus, the authority should (1) be trained in issues of bicycle and pedestrian accommodations and/or (2) contain a member who is an expert on transportation issues.

11. Accountability

Issue: Existing benchmarks and performance measures for pedestrian and bicycle issues are limited and are not always tracked on a statewide basis.

Policy Direction: NCDOT should identify and track progress over time on the goals and objectives identified in this Plan. The agency should use a defined set of data to benchmark progress on a statewide level, as well as at the local and division levels.

Action Items

- A. Adopt the priority performance measures in Chapter 8 and collect baseline data to establish a starting point where data does not exist. For instance, evaluate usage of specific bicycle facility types (Count technologies should be considered).
- B. Coordinate data collection efforts with MPOs and local governments to ensure a coordinated and cohesive approach.
- C. Continue report card effort that assesses progress on the performance measures. Expand pedestrian and bicycle performance metrics.

4 Bicycle Infrastructure



Hertford, NC

OVERVIEW

The nature of cycling has changed. The most energy-efficient form of transportation and the reason that we initially paved our roads, cycling was once the darling of European and American trend-setters. The advent of the automobile pushed cycling and cyclists to the roadway edges, but the pure advantages of the bicycle – ease of use, convenience, comfort, range, and cost-efficiency – did not allow the bicycle to fade into obscurity. Our planning, design, and maintenance processes, as well as land development practices, are all heavily skewed towards motor vehicle mobility and access, and this fact has hampered the growth of cycling still further. The following chapter considers how to reverse a long-standing trend and create more complete, safer, and more community-oriented transportation systems for small towns, cities, and rural areas in our state.

There have been many bicycle-related successes in North Carolina. For example, the State has identified nine different bicycle routes traversing over 3,000 miles of North Carolina's Piedmont plains, mountains, and coastal areas. The State's annual Cycle North Carolina ride covers all three terrains in just a week. Small towns from Scotland Neck to Marion host annual bicycle rides, and count on these to help boost their economies. North Carolina has supported the development of bicycle plans throughout the State by providing funds for planning grants, administering the Safe Routes to School Program, and providing facilities from bicycle-safe railing treatments on bridges to wide outside lanes to pedestrian/bicycle overpasses of major facilities.

However, bicycling for transportation is not an equivalent choice to driving today in North Carolina. There is a lack of connected bicycle facilities across North Carolina communities. Urban and suburban roads generally lack bicycle lanes, multi-use sidepaths, sharrows, or cycle tracks. Rural roadways lack paved shoulders (Approximately 6.7% of the North Carolina state bike route system features paved shoulder). In addition, thousands of bicyclists are struck by motorists every year.

In this Chapter

Overview

Types of Bicyclists

Bicycle Facility Preferences
and Factors Discouraging
Bicycling

Bicycle Facility Types

Current Process for Funding
and Constructing Bicycle
Facilities

Methods of Implementing/
Constructing Bicycle
Facilities

Recommendations

Common Bicycling Issues Throughout the State

The sampling of statements from various bicycle plans and planning documents underscores the degree of support for bicycling in North Carolina by municipalities, counties, universities and our state.

Wrightsville Beach Bicycle Corridor Study (2009)

"While current land use and existing infrastructure offer ample opportunity to provide bicycling connections to/from Wrightsville Beach and between local destinations, the provision of accessible bicycle facilities also entails a number of challenges including three major bridges, high-traffic roads and intersections, an environmentally-sensitive landscape and potential right-of-way constraints. All of these factors ultimately played a part in the selection of the recommended treatments and are key components of any context-sensitive design that addresses local needs, budget limitations and environmental conservation issues. While challenges to implementation do exist, this study provides a sustainable design approach that addresses the community's need to provide safe, accessible and convenient bicycle facilities for town residents and visitors of all cycling skill levels."

UNC-Greensboro Bicycle Master Plan (2008)

"With anticipated campus development of more than 1.5 million square feet and future campus enrollment numbers of nearly 22,500 full-time students by 2025, it is important for the University to focus on opportunities to increase bicycling and other sustainable transportation options to and around campus.¹ The

¹ UNC-Greensboro Campus Master Plan: www.uncg.edu/fjpl/CampusMasterPlan.html

Campus Bicycle Master Plan aims to evaluate current bicycling conditions at UNCG and recommend projects, programs and policies to improve bicycle-friendliness."



▲ UNCG was the first school in the state recognized as a Bicycle Friendly University. Photo: www.uncg.edu.

Winston-Salem Comprehensive Bicycle Master Plan (2005)

"Many factors go into determining the quality of life for the citizens of a community: the local education system, prevalence of quality employment opportunities, and affordability of housing are all items that are commonly cited. Increasingly though, citizens claim that access to alternative means of transportation and access to quality recreational opportunities such as parks, trails, greenways, and bicycle routes, are important factors for them in determining their overall pleasure within their community. Communities that are attractive for residents can also attract new businesses and industries, and in turn, additional residents."

Haywood County Comprehensive Bicycle Plan (2012)

"...Rapid growth creates a variety of conflicts among transportation modes and interests as pressures mount on state and local agencies to improve traffic conditions as the needs of bicyclists and pedestrians are sometimes overlooked when new neighborhoods or shopping centers are approved. Historically the needs of bicyclists have been a secondary consideration across the United States but have received more attention in the past 10 years due to changes in policies at the federal level and increases in bicycling as a recreational and commuting activity."

NCDOT Complete Streets Planning and Design Guidelines (2012)

"Providing for bicycle quality of service may vary based on context. The surrounding land use, the speed of cars on the street, and the directness of the route connecting destinations are all important factors in identifying the appropriate elements for

bicycle facilities. In addition, there are different types of bicyclists with varying levels of expertise. While bicyclists have the legal right to use the traffic lanes, some cyclists will be more comfortable than others riding in mixed traffic. Creating viable transportation options means that a variety of types of facilities should be provided to create a bicycling network. Creating bicycling networks is often an incremental process, and facilities should be provided where appropriate."


From this range of entities – university, state; town and city; coastal plain, mountains and piedmont – it is possible to see that the diversity of interest does not translate into a diversity of commitment. North Carolina is unusual even among most of its peer southeastern states in that it owns and maintains a disproportionate amount of the transportation system: approximately 75% and over 80,000 lane-miles of roadway are managed by a single entity. This extraordinary level of ownership, and the associated level of low ownership of other government agencies, particularly North Carolina's counties, has produced a dynamic that forces North Carolina to be both cautious while simultaneously enabling it to be a rapid implementer of new ideas once they are adopted. North Carolina's primacy in the provision and maintenance of public transportation facilities, whether directly or through financial contributions, also positions it to be a strong leader in creating innovative bicycle facilities, programs, and treatments.

The following sections provide a brief description of types of bicyclists, types of bicycle facilities, and current programs available for implementing an improved bicycle environment in North Carolina. The final section discusses how changes can be considered that would further improve bicycling in our State.

TYPES OF BICYCLISTS

It is important to consider bicyclists of all skill levels when creating a non-motorized plan or project. Bicyclist skill level greatly influences expected speeds and behavior, both in separated bikeways and on shared roadways. Bicycle infrastructure should accommodate as many user types as possible, with decisions for separate or parallel facilities based on providing a comfortable experience for the greatest number of people. A framework for understanding the characteristics, attitudes, and infrastructure preferences of different bicyclists in the US population as a whole is illustrated at below.

Table 4.1 Types of Bicyclists



Strong and Fearless (approximately 1% of population)	1%	Strong and Fearless
Characterized by bicyclists that will typically ride anywhere regardless of roadway conditions or weather. These bicyclists can ride faster than other user types, prefer direct routes and will typically choose roadway connections -- even if shared with vehicles -- over separate bicycle facilities such as shared use paths.	5-10%	Enthusied and Confident
Enthusied and Confident (5-10% of population)	60%	Interested but Concerned
This user group encompasses bicyclists who are fairly comfortable riding on all types of bikeways but usually choose low traffic streets or multi-use paths when available. These bicyclists may deviate from a more direct route in favor of a preferred facility type. This group includes all kinds of bicyclists such as commuters, recreationalists, racers and utilitarian bicyclists.		
Interested but Concerned (approximately 60% of population)	30%	No Way, No How
This user type comprises the bulk of the cycling population and represents bicyclists who typically only ride a bicycle on low traffic streets or multi-use trails under favorable weather conditions. These bicyclists perceive significant barriers to their increased use of cycling, specifically traffic and other safety issues. These people may become "Enthusied & Confident" with encouragement, education and experience.		
No Way, No How (approximately 30% of population)		
Persons in this category are not bicyclists, and perceive severe safety issues with riding in traffic. Some people in this group may eventually become more regular cyclists with time and education. A significant portion of these people will not ride a bicycle under any circumstances.		

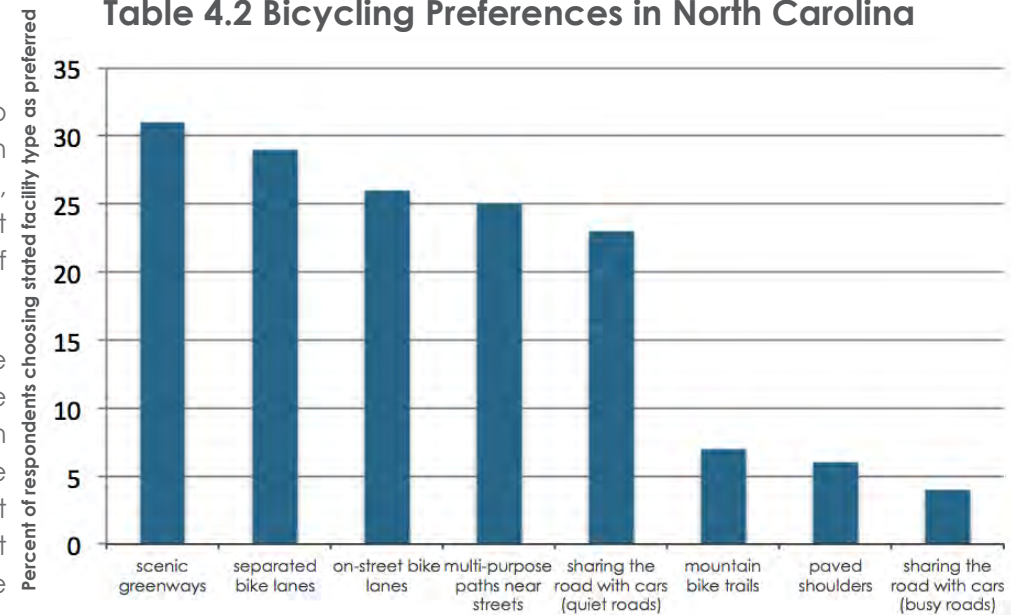
Source: Four Types of Cyclists. (2009). Roger Geller, City of Portland Bureau of Transportation. Supported by data collected nationally since 2005.

BICYCLING PREFERENCES AND FACTORS DISCOURAGING BICYCLING

In 2012, the WalkBikeNC project website allowed visitors to select preferences for bicycle facility types. The results in Table 4.2 (right) show a preference for separated facilities, with paved shoulders and busier roads being the least preferred (see the following pages for brief descriptions of facility types).

Using information collected through NCDOT's Bicycle and Pedestrian Planning Grant Initiative, it is also possible to gauge the factors that discourage bicycling in North Carolina. Table 4.3 (below) shows the results from more than 3,000 comment forms, collected in six different communities, from 2005-2011. Similarly, in a 2012 comment form for the *Wilmington/New Hanover Greenway Plan*, more than 3,700 residents indicated a 'lack of safe connections to greenways' and 'unsafe street crossings' as the biggest factors discouraging greenway use.

Table 4.2 Bicycling Preferences in North Carolina



Source: WalkBikeNC Public Input from MindMixer, 2012

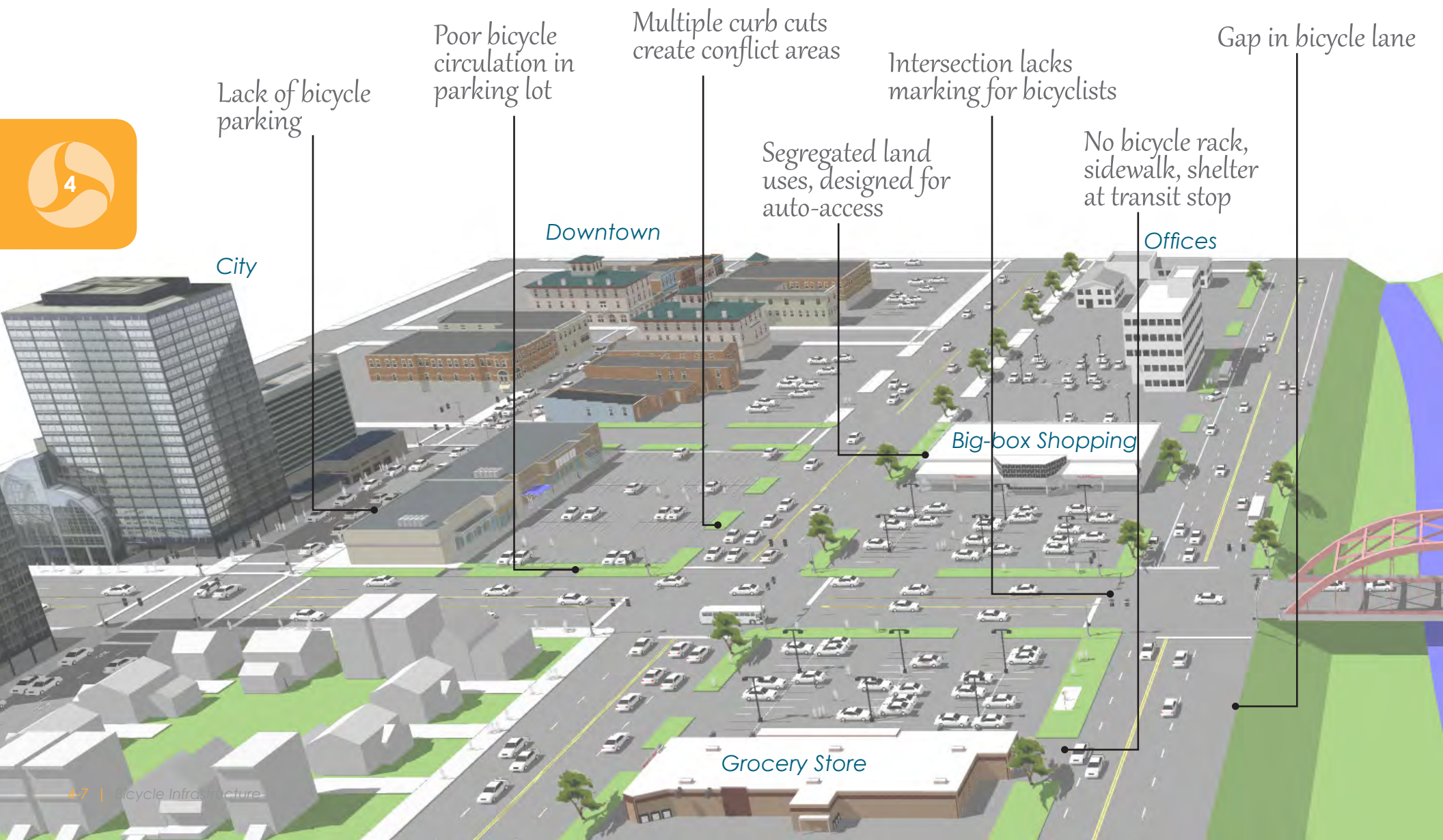
Table 4.3 Top Factors Discouraging Bicycling in North Carolina Communities

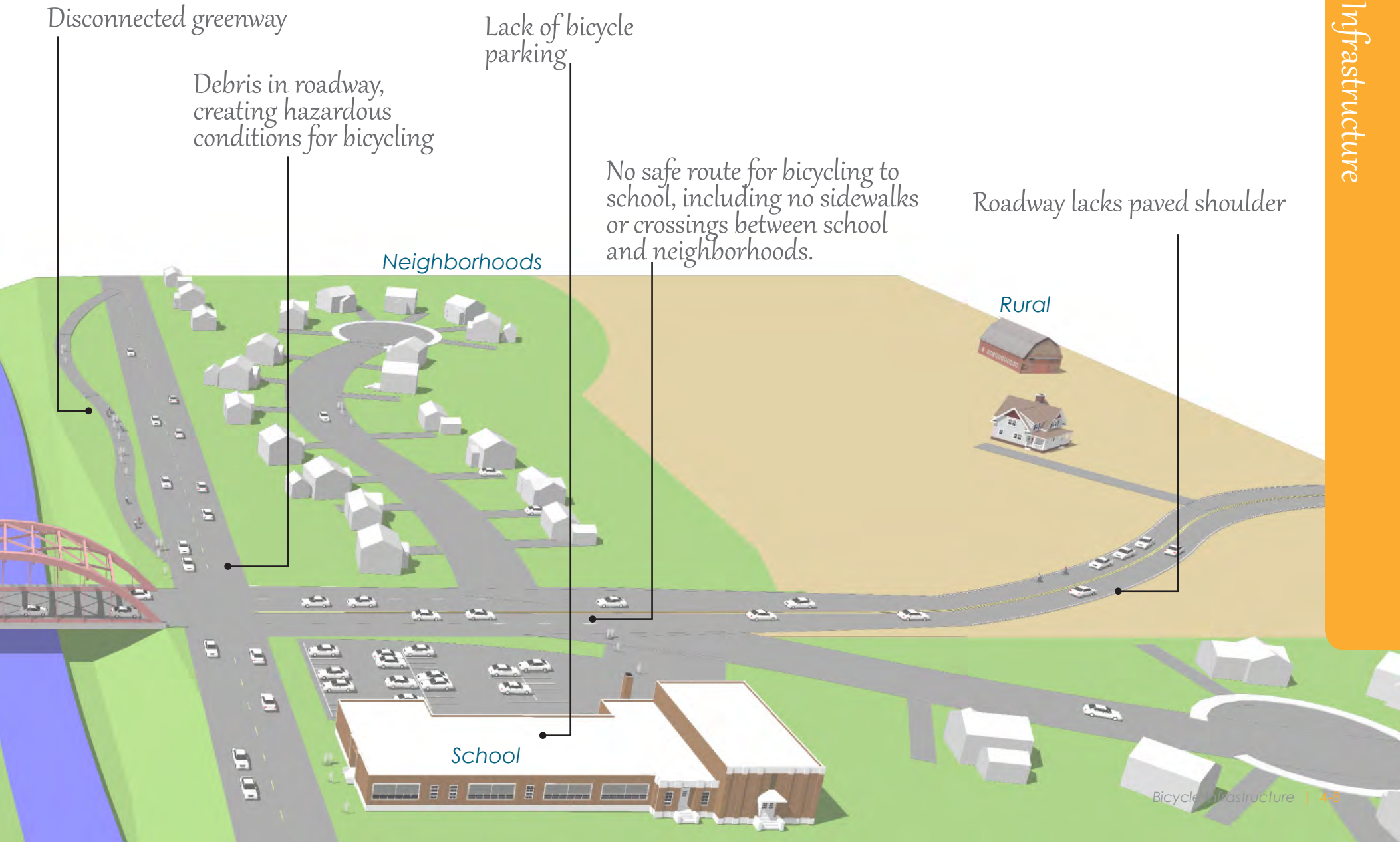
	Lack of bicycle lanes, shoulders, or paths	High-Speed Traffic	Narrow Lanes	Inconsiderate Motorists	Heavy Traffic	Gaps in Bicycle Facilities	Crossing Busy Roads
City of Raleigh 701 respondents/2009	#1	-	#3	#2	-	-	-
Greenville Area MPO 694 respondents/2011	#1	#2	-	#3	-	-	-
Greensboro Urban Area MPO 609 respondents/2005	#1	#2	-	#3	-	-	-
City and County of Durham 604 respondents/2006	#1	#2	-	-	#3	-	-
Town of Carrboro 328 respondents/2008	#1	-	#2	-	-	#3	-
Town of Southern Pines 320 respondents/2010	#1	-	#2	-	-	-	#3

Source: Public comment forms from each of above communities, collected as part of their bicycle transportation planning processes (2005-2011).

TRANSPORTATION CHOICES: BICYCLING VS. DRIVING IN NORTH CAROLINA

This graphic illustrates how most urban, suburban, and rural areas in North Carolina are designed primarily for the automobile. Driving an automobile is currently the most convenient mode of travel for many North Carolinians because our roadway network is designed for driving and our land uses tend to be segregated and separated by long distances, making bicycling from origin to destination challenging. North Carolina currently lacks a contiguous, interconnected and consistent network of bicycle facilities and services that would encourage bicycling as a viable choice for transportation.

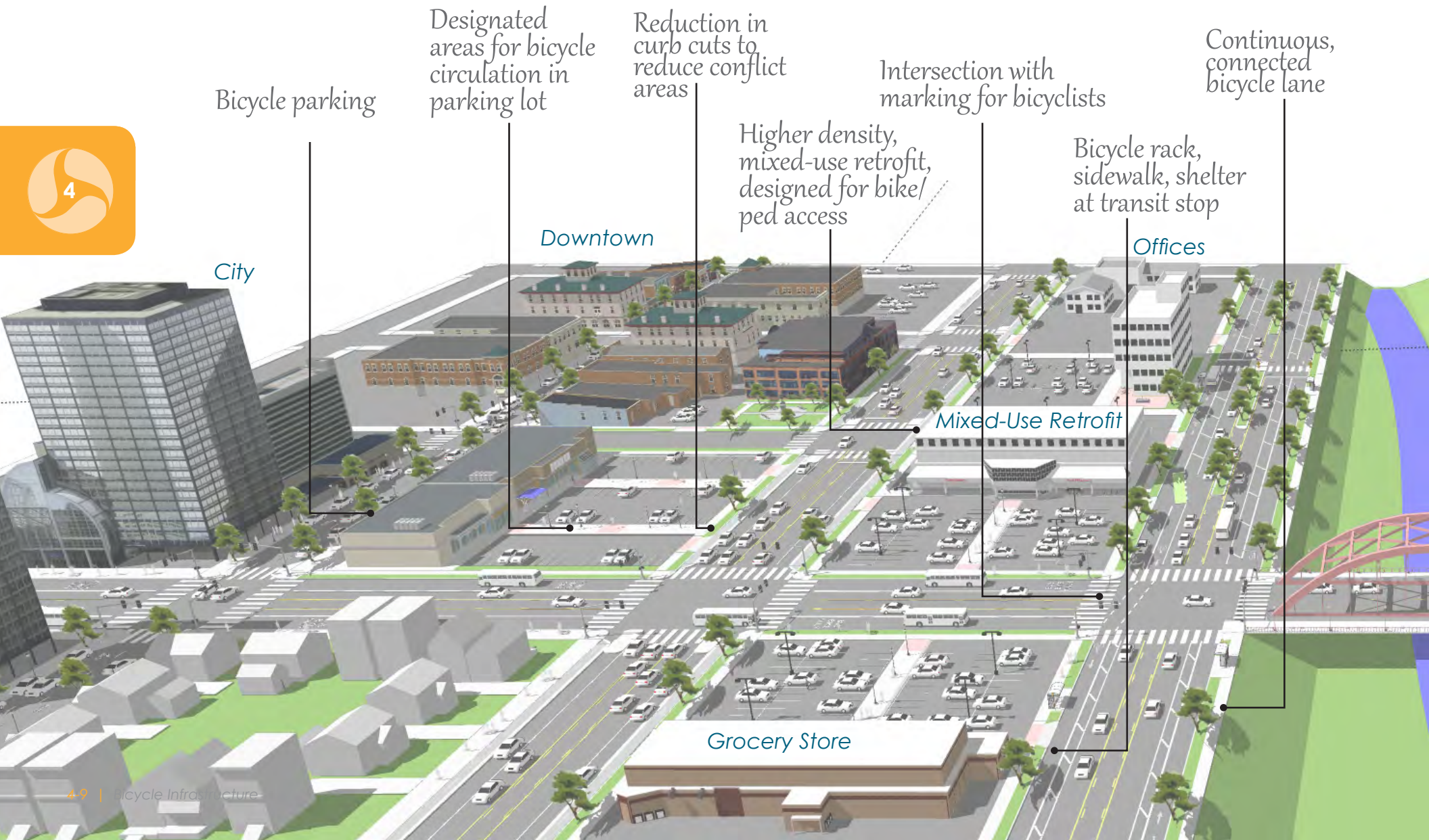


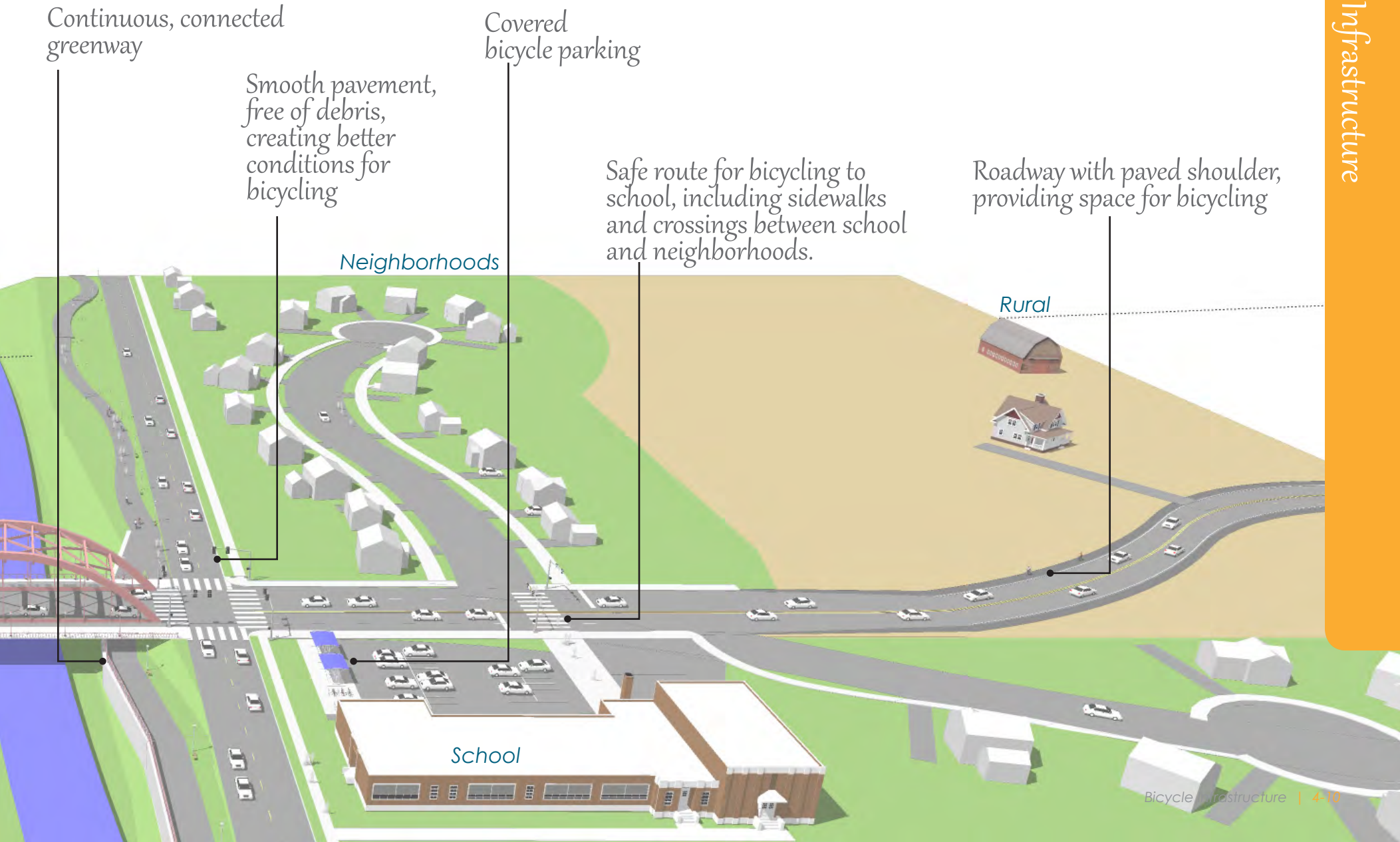


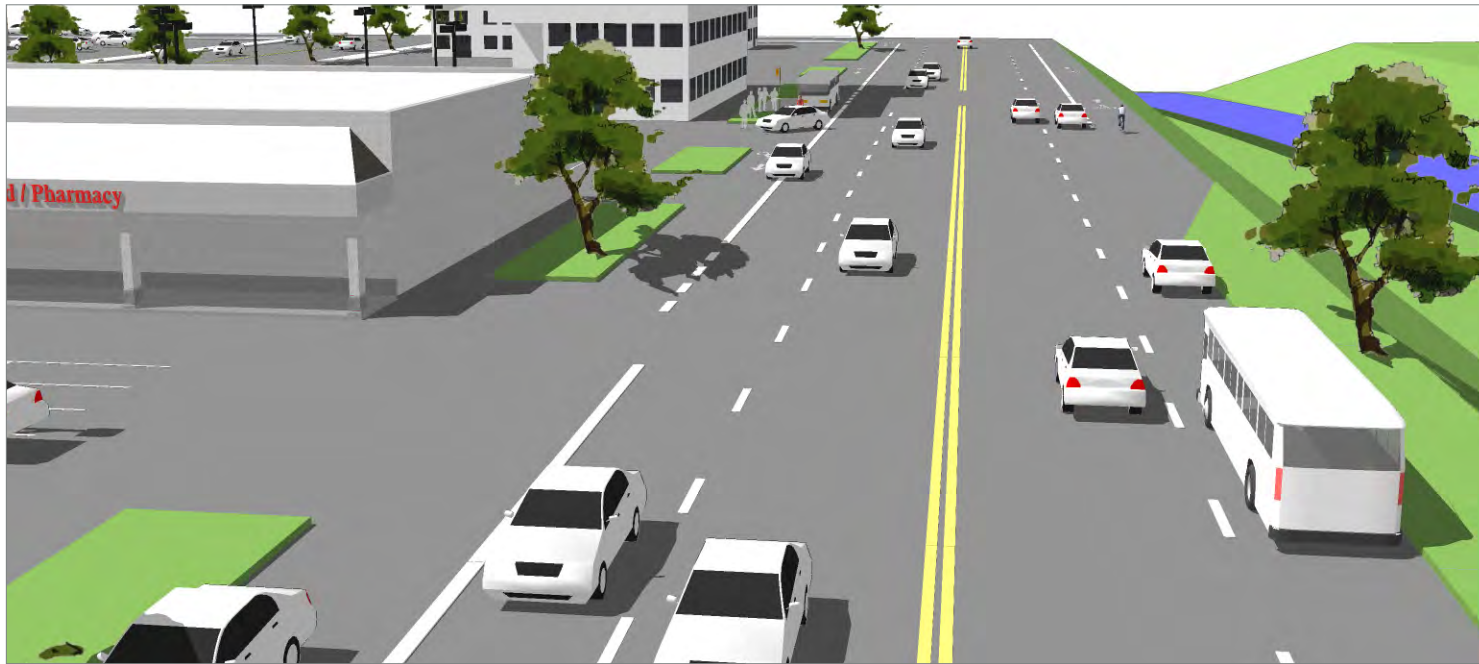
IMPROVING NORTH CAROLINA'S BICYCLING

[Draft Comments: www.monkey.com/s/WalkBikeNC_Draft](https://www.monkey.com/s/WalkBikeNC_Draft)

This graphic illustrates how most urban, suburban, and rural areas in North Carolina can be retrofitted to better serve all of NCDOT's transportation 'customers' including the full range of bicyclist types. In addition to the bicycle project examples below, issues with land use and trip distances will also need to be addressed, mostly on the local and regional level. This could include a greater mix of land uses, higher densities of land use, infill development, and reinvestment in NC's downtown areas. Land use and development strategies such as these serve to not only reduce infrastructure costs and preserve open space, but they also shorten daily trip distances, making bicycling a more viable choice for everyday transportation.





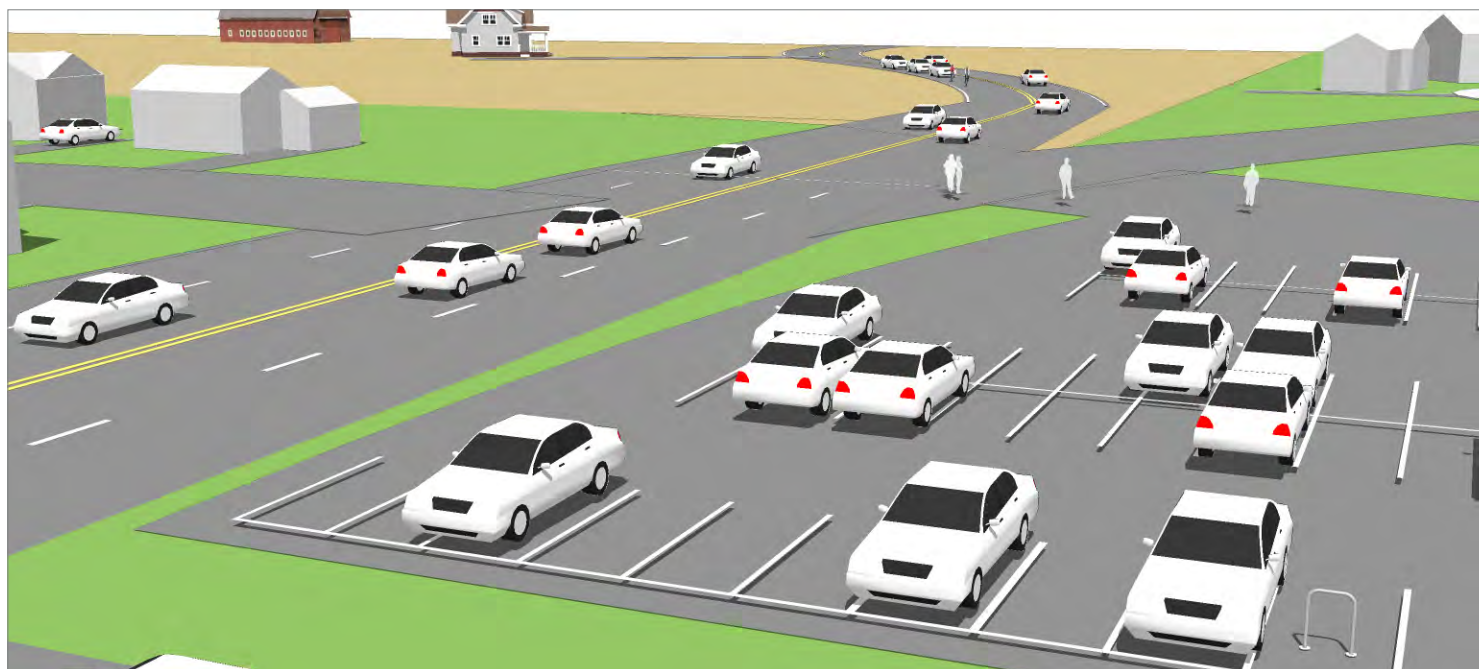


Example of current conditions for bicyclists.



Example improvements for bicyclists, including buffered bicycle lanes and colorized pavement markings for high conflict transition areas.

Example of current conditions for bicyclists. ▶



Example of improvements for bicyclists, including covered bicycle parking, neighborhood-to-school crossing, and paved shoulders on rural roads. ▶



BICYCLE FACILITY TYPES

The types of bicycle facilities available in North Carolina can be expressed as either on- or off-road. North Carolina has not adopted a great number of the more recent treatments, such as cycle tracks, bicycle boulevards, or green lanes – but there are examples of each on the ground and more are being considered as time goes on. The following is a list from the most basic where cyclists are treated more as vehicles that share the road with automobiles – which is the way that North Carolina State law treats cyclists – from facilities that are more separated from the roadway environment.

- **Wide Outside Lanes:** The mainstay of cycling facilities in North Carolina for at least the past decade (“pre-complete streets era”) has been the addition of 14’-wide outside lanes. Wide outside lanes provide additional space for passing cyclists that stay to the right of center but also provide a recovery area for all types of vehicles. Most cyclists, with the exception

of “Strong and Fearless,” will not however ride in this situation, sharing a lane with vehicles.

- **Sharrows or Shared-Lane Markings:** Sharrows have become more popular as a pavement marking treatment to help align cyclists properly within more complex, urban landscapes that may feature on-street parking, a variety of lane widths, and other factors. Additionally, sharrows help remind motorists of the potential presence of cyclists and their right to be in the main travel lane with automobile traffic. On their own, sharrows may not attract “Interested but Concerned” cyclists.
- **Striped Shoulders or Wide Striped Shoulders:** Similar to wide outside lanes, striped shoulders are much more frequently found on rural cross-sections that don’t employ vertical separation from the edge of pavement. Wide striped shoulders provide additional protection to cyclists in terms of helping keep auto traffic separated from cyclists. However, the striped shoulder has come under periodic fire from cyclists that suggest the additional separation does not allow the surface to be “swept” clear of debris by the passage of motorists, and may present additional conflicts between motorists and cyclists since they are traveling in separate pathways. The N.C. Complete Streets Guidance leans heavily on four to six ft. wide paved shoulders as a preferred treatment in several contexts.
- **Bicycle Lanes:** Bicycle lanes are defined as a portion of the roadway that has been designated by striping, signage, and pavement markings for the preferential or exclusive use of bicyclists. The bike lane is located adjacent to motor vehicle lanes typically on the right



◀ Bicycle Lanes
in Duck, NC

side of the street, between the adjacent travel lane and curb, road edge, or parking lane. Bike lanes enable bicyclists to ride at their preferred speed without interference from prevailing traffic conditions and facilitate predictable behavior and movements between bicyclists and motorists. Bike lanes are typically used in curb-and-gutter contexts where the number of driveway cuts is lower, often in transitioning or urbanizing “fringe” areas that have more moderate vehicular travel speeds. A more recent development is the use of green pavement markings to delineate driveway openings or the full length of a bicycle lane so as to further separate a cyclist – at least perceptually – from adjacent motorized traffic. Bicycle lanes often have similar maintenance issues as paved shoulders. Because bicycle lanes are only separated by a stripe of paint, “Interested but Concerned” bicyclists may still not be comfortable, especially on major roadways.

- **Bicycle Boulevards:** Bicycle boulevards are streets with low motorized traffic volumes and speeds, designated and designed to give bicycle travel priority. Bicycle boulevards are typically on local and minor collector roadways with elements such as pavement markings, signage, and speed and volume management measures. These facilities are intended to cater to low-skill or young riders, but they also tend to “calm” automobile traffic and are therefore perhaps more attractive to neighbors that want to slow down automobile traffic. Bicycle boulevards have been documented as increasing ridership in major cities like Portland, especially among “Interested but Concerned” cyclists.

Directional signage for the Bicycle Blvd on Anne Street in Wilmington, NC ►



- **Cycle Tracks:** Cycle tracks, while used more often in northern European countries than in the U.S., create a separate bicycles-only facility to one side of the roadway, and are separated by curbing, bollards, landscaping or other barriers. A cycle track combines the user experience of a separated path with the on-street infrastructure of a conventional bike lane. Like other separated treatments, cycle tracks appeal to a wider spectrum of the public and require careful design, especially at intersections. Cycle tracks may not be able to be maintained during long periods of inclement weather, as snow removal and sweeping trucks are often unable to access their narrower passageway. Cycle tracks are attractive to the “Interested but Concerned” segment of the population. However, implementation may be more difficult and intersection crossings require special design.



- **Greenways/Sidepaths:** Greenway is a generic term that may include paved or unpaved trails that are completely separated from roadways (note: adjacent sidepaths, in essence greenways that parallel a roadway, share some of the same issues as both greenways and bicycle lanes, but are removed from the adjacent roadway). Greenways provide the maximum protection from automobile traffic – until they must cross a roadway at-grade. Interference from pedestrians, either along the greenway or at sidewalks, may also present a design challenge to ensure that adequate separation and notice of the intersection is provided. Greenways should be maintained and often feature “bottlenecks” of pedestrians and bicyclists.
- **Crossing Treatments.** A variety of crossing treatments are available that reflect the need to get cyclists across busy intersecting streets safely. These may include more sensitive magnetic induction loop detectors to detect the lower ferrous metal content in many modern road bicycles; bicycle boxes or stencils to indicate to both motorists and cyclists the appropriate place to wait for a signal to change; or special signage or “kick plates” to trigger a special signal phase without dismounting from the bicycle. In recent years, North Carolina has become much more interested in novel intersection designs, collectively termed “superstreets” that restrict some types of automobile turning movements. These superstreets, as well as freeway on-off ramps, present special challenges for cyclists due to the often free-flow intent to accommodate turning motor vehicles as quickly as possible. Countermeasures for these locations may include channelization islands, median island “refuges,” embedded lighting at crosswalks, and tighter corner radii to slow

◀ Cycle Track in Washington DC;
Image: Flickr user Elvert Barnes
(need to secure permission)

down turning speeds. The ultimate crossing solution is a separated grade facility, either a bridge over or a tunnel/culvert structure under the crossing mainline roadway. However, in urban locations it can be difficult to convince a cyclist (or pedestrian) to use what may be a considerably more circuitous and time-consuming path to access and cross at a separated-grade structure.

Almost all of the shared-space treatments – wide shoulders, striped shoulders, bicycle lanes – can significantly improve motorist safety since they provide additional recovery room in the event of a loss of control of a vehicle. Other measures, such as improving street lighting, also benefit every type of roadway user. While cycle tracks and bicycle boulevards are much less common in North Carolina so far, their safety benefits to cyclists, as well as the degree to which they may encourage lower skill-level cyclists, has been demonstrated in some recent literature.²

CURRENT PROCESS FOR FUNDING AND CONSTRUCTING BICYCLE FACILITIES

Bicycle facilities are planned, designed, and built by municipalities, private developers, NCDOT, and others in North Carolina. The State, municipalities, and counties have dedicated funding streams but also have access to a number of grant-related programs. Cities and counties can implement projects through their own capital improvement programs (CIPs), tax increment financing, bonds, and other means including raising property valuation tax rates.

Cities and towns throughout the State fund their own

² Teschke, Kay, PhD, et. al., “Route Infrastructure and the Risk of Injuries to Bicyclists: A Case-Crossover Study,” *American Journal of Public Health*, October 18, 2012. Pages e1-e8.



▲ Sidepath construction in Emerald Isle, NC

streetscape improvement projects that both provide for the encouragement and safety of pedestrians and bicyclists. For example, the City of Raleigh's Transportation CIP Budget allocates funding for sidewalk construction, maintenance, and repair, streetlight installations, and bicycle facility improvements. In 2012, \$500,000 was dedicated for bicycle marking/stripping projects that were recommended in the *Raleigh Bicycle Transportation Plan*. In 2012, the City of Raleigh also received a Congestion Mitigation and Air Quality Grant through the Capital Area Metropolitan Planning Organization for \$1.1 million that required a \$225,000 local match. The Raleigh City Council approved the combination of these two efforts into a single project to stripe dozens of miles of on-road bicycle facilities in 2013-2014.

Private developers are also a contributor of bicycle facilities, most notably bicycle lanes and greenways. These improvements are determined by local zoning and

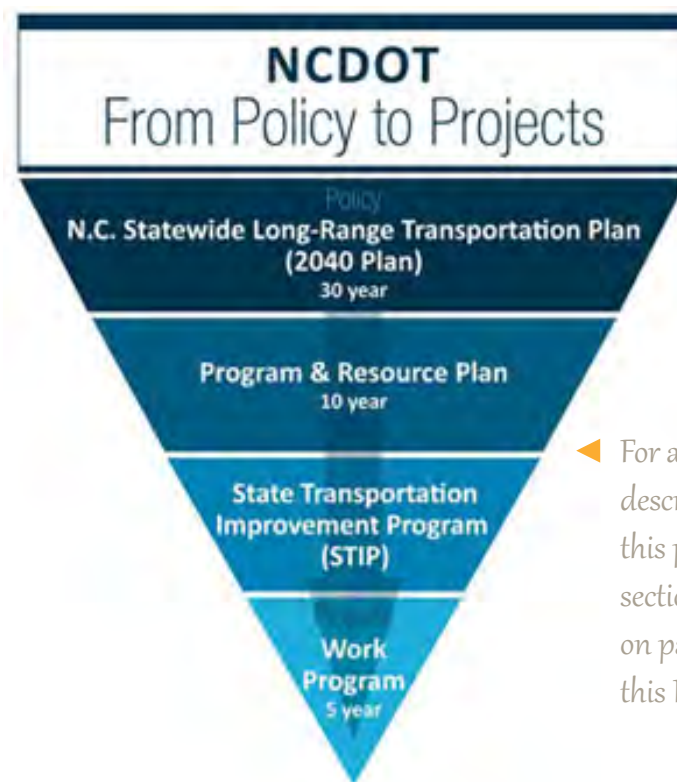
subdivision requirements. Existing codes and standards regulate the infrastructure that both public and private entities construct so it is critical that these local requirements are consistent with complete streets principles such that they create a built environment that equally meets the needs of pedestrians, bicyclists, motorists, and transit users. Counties in North Carolina typically do not place the same level of requirements for the preservation of rights-of-way or construction of pedestrian and bicycle facilities as their municipal counterparts. Even among municipalities, there are significant differences in the amount of responsibility that private development incurs in the construction of pedestrian and bicycle facilities. Without requirements, private entities are beginning to fund transportation projects in North Carolina. Working with NCDOT and local municipalities, private entities have supported bicycle lanes and greenways in recent years.

NCDOT also builds bicycle facilities. Most construction of pedestrian and bicycle facilities occurs at the local or Highway Division level. The current statewide allocation for bicycle improvements is divided by a ratio among the state's fourteen highway divisions. In addition to state funding, the Department sets aside federal funds from eligible categories for the construction of bicycle transportation facilities.

Broadly speaking, there are two types of pedestrian and bicycle infrastructure projects. Independent projects are those where pedestrian or bicycle facilities comprise the entire project. These projects are conceived by municipalities based on a perceived local need and submitted to the local Metropolitan Planning Organization (MPO) or Rural Planning Organization (RPO), which then prioritizes all projects received. Based on the prioritization inputs of MPO and RPOs, NCDOT DBPT implements as many projects as funding allows based on its own prioritization

process. Independent projects are prioritized, funded and constructed separately from the standard roadway project development process.

Incidental projects are those included as a part of a larger street or highway project. These projects are identified either during project development/scoping or through the "Policies to Projects" process that begins with long-range goals and investment decisions and ends with a detailed work program that spells out specific projects needed to achieve the goals. The process begins with the 30-year Statewide Long-Range Plan and ends with the 5-year Work Program. These plans and programs are summarized in Chapter 3, but they apply to bicycle planning as well.



▶ For a full description of this process, see section starting on page 3-10 of this Plan.

METHODS OF IMPLEMENTING/ CONSTRUCTING BICYCLE FACILITIES

Programmed Roadway Construction/Resurfacing

Roadway reconstruction and resurfacing projects offer a cost-effective clean slate for revising pavement markings. When a road is repaved, roadways may be restriped to provide space for bike lanes and shoulders. In addition, if the spaces on the sides of non-curb and gutter streets have relatively level grades and few obstructions, the total pavement width can be widened to include paved shoulders. The same can be done with bridge replacement projects, which typically occur every 50-75 years, to accommodate pedestrians and bicyclists.

Striping and Restriping

The simplest type of restriping project is the addition of bicycle lanes, edgelines, or shoulder stripes to streets without making any other changes to the roadway (striping project). Bicycle lanes, edgelines, and shoulder stripes can also be added by narrowing the existing travel lanes (restriping). Roadways may be restriped at any time or during a resurfacing project. This method represents an opportunity for adding pedestrian and bicycle facilities while working within the construct of an existing right-of-way width. For additional information and current research on travel lane widths to accommodate bicycle lanes, see Appendix 10.6.

“Road Diet”

Some roads may require a “road diet” solution in order to accommodate bicycle facilities. Road diets involve removing vehicle travel lanes and replacing these lanes with on-road bicycle facilities and sidewalks or sidepaths.

These are generally recommended only in situations where roadways are bigger than they need to be and vehicular traffic count can be safely and efficiently accommodated with a reduced number of travel lanes.

The City of Charlotte has completed almost 30 road diets in the last ten years, with an additional 20 being studied. The City has conducted road diets successfully on roadways with over 20,000 ADT. These projects have been successful by creating more vibrant communities, economic development, and increased safety for all roadway users.



▲ Before and after a ‘road diet’ in New Bern, NC

RECOMMENDATIONS

NCDOT's Complete Streets Policy emphasizes that the agency is committed to "providing an efficient multi-modal transportation network in North Carolina such that the access, mobility, and safety needs of motorists, transit users, pedestrians, and bicyclists of all ages and abilities are safely accommodated." The *Complete Streets Design Guidelines*, published in 2012, inform the design and implementation of complete streets elements as part of all ongoing and upcoming projects. The recommendations below, in addition to the design policy recommendations found in the Policy chapter of this document and the Bicycle & Pedestrian Toolbox in Chapter 6, will serve as the next steps in the state's efforts to improve bicycle conditions. The recommendations below include bicycle-related policy, design, and process elements.

1. Safety and Data Analysis (see Chapter 4)

Issue: NCDOT collects and analyzes bike crash data on an ongoing basis. Currently, NCDOT, with the assistance of the Highway Safety Research Center, is geocoding the locations of historical data. Municipalities also often maintain a separate database of crash information that are coded in a unique way. Analysis reports of crash types have been developed but need to better inform countermeasures and design decisions. In many cases, bicycle crashes are reported incorrectly by law enforcement or not reported at all. Finally, countermeasures are often implemented in reactive manner as opposed to preventative method.

Policy Direction: NCDOT should continue to expand its collection and analysis of bicycle crash data. The agency should continue to use crash data to better understand trends and how they can be improved and to prioritize investments, through independent and routine accommodations. The agency should also work with municipalities, hospital systems, and DHHS Injury Prevention to gain more data about pedestrian and bicyclist injuries. Efforts should be made to "get ahead" and prevent crashes rather than reacting to crash fatalities.

NCDOT should move forward with two distinct, but equally important, sets of actions: 1) Pro-active strategies for preventing bicycle crashes based on established research, North Carolina-based data, and crash occurrences and 2) Strategies to improve crash reporting/data and using that information to prioritize infrastructure investments in the future.

Action Items/Proactive Safety Strategies:

- A. Implement "Complete Streets" approach consistently with all roadway projects to ensure a connected, accessible, and safe pedestrian and bicycle network.
 - Evaluate facilities and programs for their capability to improve motorist/pedestrian/bicyclist compliance and safety. Utilize national studies to support design solutions for safety improvement (see Chapter 6 - Pedestrian & Bicycle Toolbox).
- B. Develop strategy to advertise and educate NCDOT Division staff, MPOs/RPOs, cities, counties, advocates, and law enforcement staff across the State about HSRC crash analysis and data and trends in North Carolina. As part of this, consider developing a mapping application available on DBPT's website to show crash information.

- C. Maintain the Safety & Mobility safety audit team to review roadway improvement plans in high crash locations. This team should be proactive utilizing pedestrian/bicycle crash data regularly. One important element of this work is to evaluate crash data and identify potential conflicts within a proposed project area.
- D. Continue successful pedestrian/bicycle safety reviews conducted by the Traffic Safety Unit (examples: Fayetteville and the Outer Banks (US 158) in areas of safety concern.
- E. Develop an injury minimization approach for setting speed limits on new roadways and major roadway reconstruction projects. The approach should identify the intended operational speed at the outset of a project based on the context and local preferences, and then design the road to ensure higher speeds are uncomfortable for drivers.
- F. Implement education, encouragement, and enforcement programs as detailed in Chapter 7.
- G. Engage more stakeholders in a comprehensive approach to improving safety for bicyclists. Hold Pedestrian and Bicycle Safety Summits every two years to discuss new trends and evaluate progress.
- H. Remain current with research regarding bicycle safety as bicycle planning and design is evolving rapidly in the United States (for example, the NACTO 2012 Guide is being used more regularly across the United States).
- I. Address safety needs of different types of bicyclists described earlier in this chapter. Bicycle networks should be planned and designed by NCDOT, with cooperation from MPOs/RPOs and municipalities, to

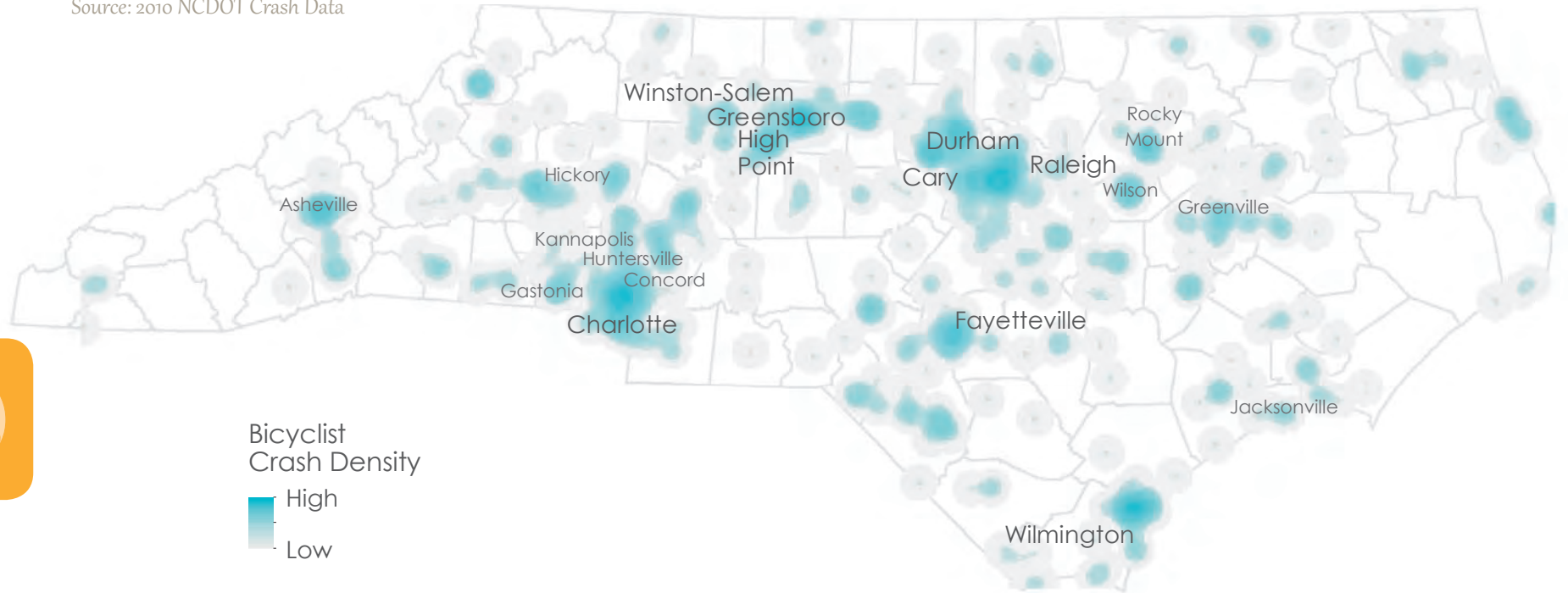
Table 4.4 Bicycle Crash Reduction Factors

Design Treatment / Intervention	Impact
Provide bicycle lanes	36% reduction in bicycle crashes ^A
Provide protected bicycle lanes	40% reduction in crashes for all users ^B
Provide colored bicycle lanes in conflict areas	15% motorist yield rate increase and 36% motorist turn signal rate increase ^C
Provide bicycle box (advance stop bar to leave dedicated space for bicyclists)	36% reduction in bicycle crashes ^A
Provide cycle tracks	28% lower injury rate ^D
Provide shared lane markings (sharrows)	Motorists more likely to change lanes when passing and are less likely to pass ^E ; 80% reduction in wrong-way bicycling. ^F

- A. Federal Highway Administration. Desktop Reference for Crash Reduction Factors. <http://safety.fhwa.dot.gov/>
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- C. Brady, J., Mills, A., Loskorn, J., Duthie, J., Machemehl, R., Center for Transportation Research. (2010). Effects of Colored Lane Markings on Bicyclist and Motorist Behavior at Conflict Areas. City of Austin, Texas.
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2010 Bicycle Crash Density Map, NC

Source: 2010 NCDOT Crash Data



Case Study: STRUCK Crash Project

STRUCK, a 2012/2013 joint venture project between New Hanover Regional Medical Center's Injury Prevention department, New Hanover County's 9-1-1 Call Center, New Hanover County GIS, and the Wilmington MPO, is an effort to compare NCDOT bicycle/pedestrian crash data with pedestrian and bicyclist injuries reported to 9-1-1. It is known that there are more crashes called in to 9-1-1 than are on record in the NCDOT database. The 9-1-1 Call Center has geocoded locations of crashes and the New Hanover Regional Medical Center (NHRMC) is relating that data on severity of patient injury. NHRMC will publish a paper on this project. The Wilmington MPO plans to utilize this data, combined with NCDOT data to prioritize and justify bicycle/pedestrian investments.



create connected networks that provide facilities along arterials/collectors but also provide separated facilities such as multi-use paths and lower traveled roadways such as bicycle boulevards.

Action Items to Improve Safety Data:

- A. Continue to explore ways to improve the quality and completeness of bicycle crash data, including working with municipalities, hospital systems/emergency response, law enforcement, HSRC, and MPOs/RPOs to more consistently and accurately record crash events and to share data.
- B. As part of increased engagement as suggested above, establish Statewide Pedestrian and Bicycle Safety Consortium to develop consistent, thorough recording of crashes that will allow for more comprehensive, consistent databases. The Consortium could also support WatchForMeNC program.
- C. Evaluate the existing HSIP prioritization and project programming process and adjust as needed to ensure HSIP funds are distributed proportionately to the percentage of pedestrian and bicycle crashes in the State.
- D. Conduct studies to isolate high pedestrian and bicycle crash locations and coordinate results with the HSIP process to provide pedestrian countermeasures in these locations. The agency should explore the development of a model to estimate pedestrian and bike volumes, with the purpose of developing better prioritization methods that account for crash rates in addition to crash frequency. If possible, the model should be compatible and/or coordinated with analytical models currently used by other state agencies.

2. Transit Access

Issue: Existing transit-related policies do not fully account for the critical link between transit and bicycle transportation. Some NCDOT policies make it difficult to improve access to transit. It is critical that transit access facilities maintain safety for all roadway users, including pedestrians and bicyclists.

Policy Direction: Strong bicycle connections to transit stops and stations are integral to the success of North Carolina's transit systems. NCDOT should reassess policies with an eye toward ensuring roadways and transit stations/stops are safe, accessible, and attractive to bicyclists.

Action Items

- A. Ensure clear/breakaway zone policies allow transit amenities including signage, benches, shelters, bike racks and other items at urban, suburban and rural transit stops in a way that maintains safety for all users.
- B. Conduct transit access studies (using the Durham Transit Access Study as a guide) in other parts of the State to determine key local issues that need to be addressed, and to open a dialogue about transit access with local agencies. These studies should focus on connectivity to transit stops and demonstrate how a typical transit stop/station site plan should be done to ease pedestrian and bicycle access.
- C. Per the recommendations for the RDM (Chapter 6), provide detailed design guidance for the placement of bike parking and bike lockers associated with longer term transit facilities such as park and ride lots.
- D. Work with regional and local public transportation agencies to ensure bike-on-bus and bike-on-train opportunities are available along with education and ease of use.

- E. Improve communication between DBPT and Public Transportation Division to ensure meeting of pedestrian/bicyclist/transit customers needs.

3. Regional Greenway Trails

Issue: North Carolina features multiple regional trail initiatives that have successfully led to the development of long-distance trail systems such as the Appalachian Trail, Mountains-to-Sea Trail, Carolina Thread Trail, and East Coast Greenway. These trail systems are well-known statewide and nationally and promote stewardship and economic development. These trails can serve as means for both long-distance, recreational journey opportunities and local, utilitarian trips. Each trail initiative and system has different goals, serves different functions, and features

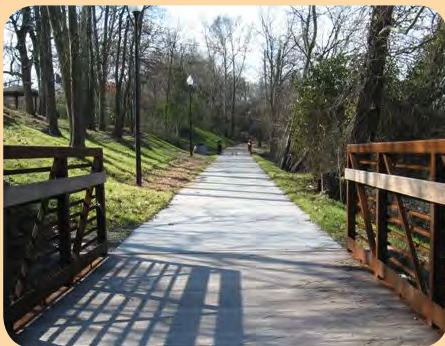
different surfaces to accommodate different users. As these trails continue to be planned and expanded, numerous obstacles exist such as land ownership, right-of-way constraints, environmental constraints, and funding. In many cases, these systems need to utilize roadway right-of-ways and often cross roadways creating conflict.

Policy Direction: NCDOT, with support from DENR and other state agencies, should prioritize regional trail systems, connectivity to regional trail systems, and regional trail crossings of roadways.

Action Items:

- A. NCDOT (especially DBPT) should build relationships and establish regular communication with the East

NC's Major Trail Systems



Mountains-to-Sea Trail

Hiking trail for pedestrians, typically along natural surface trail, but sometimes on multi-use paved surface (above: Smithfield, NC).



East Coast Greenway

Multi-use trail, although geared to bicyclists, preferably in off-road paved greenway and sometimes along roadways with paved shoulders or bicycle lane. (above: Durham, NC).



Carolina Thread Trail

Mixture of paved and unpaved, multi-use and hiking only, mountain biking trails (above: Mecklenburg County, NC)

Coast Greenway Alliance, Friends of the Mountains-to-Sea Trail, Carolina Thread Trail, and DENR. This collaboration can help build upon these trail systems to address alignments, signage, roadway crossings, and connectivity to and away from these trail systems.

- B. DBPT should continue utilizing prioritization criteria for bike/ped projects that are a part of a regional trail or connect to a regional trail.
- C. Representative agencies for these regional trails should reach out to state agencies, counties, and municipalities to discuss the goals of the regional trail systems and establish partnerships for future growth and enhancement of these systems.

4. GIS Data Standardization for Bicycle Facilities

Issue: GIS data files describing bicycle facilities are generated by many different individuals and organizations. Data are created for each plan funded through the planning grant program and formats vary significantly depending on the individual consultant and municipality completing the work. Further, many individual towns and cities create and maintain their own GIS datasets, which also vary widely in format and level of detail. The wide variation in data format makes data transfer and coordination difficult, and hinders regional efforts to catalog existing bicycle facilities.

Policy Direction: NCDOT should adopt a GIS framework covering both pedestrian and bicycle datasets that clearly defines the attributes to be inventoried and an associated nomenclature for each attribute. This framework should be mandatory for data created through the planning grant program or the Comprehensive Transportation Planning process.

Table 4.5 Recommended Format for Linear Bicycle GIS Layers

Attribute	Possible Entries
Jurisdiction	Municipality or County
Roadway Ownership	Municipality or NCDOT
Last Update	
Existing Facility	Bicycle Lane, Buffered Bicycle Lane, Cycle Track, Paved Shoulder, Wide Outside Lane, Sharrow, Signage, Bicycle Boulevard, Multi-Use Path
Condition	Good, Fair, Poor
Characteristics	Ex: Hazardous Grates, few driveways
Width	Where appropriate
Parking	On-street parking present or not present
Material	Asphalt, Concrete, Gravel, Brick, Natural
Proposed Facility	Bicycle Lane, Buffered Bicycle Lane, Cycle Track, Paved Shoulder, Wide Outside Lane, Sharrow, Signage, Bicycle Boulevard, Multi-Use Path, New Grates, Resurface
Proposed Project	New Construction, Traffic Calming, Widening

Table 4.6 Recommended Format for Point Bicycle GIS Layers (Bicycle Parking)

Attribute	Possible Entries
Type	Short-Term, Long-Term

Action Items

- A. Evaluate the framework developed by ITRE and enhanced through this planning process as a starting point, which is detailed in the following tables.
- B. Meet with GIS staff from selected major municipalities to review the draft framework in comparison to their current data formats. Modify as necessary to ensure the framework will meet the needs of local governments.
- C. Once finalized, train Bicycle & Pedestrian Division staff on this framework and direct them to ensure its use during each planning process.
- D. Distribute the framework to municipalities around the state and encourage them to generate and maintain data in this format going forward.
- E. Re-evaluate attributes and nomenclature bi-annually and update to incorporate new facilities as they are developed.

For recommendations related to GIS Data Transfer and Data Maintenance, see page 3-21 of this Plan.

5. State Bicycle Routes

See the full appendix report (Appendix 10.3) for comprehensive information on the existing conditions, methodology, analysis, and recommendations for statewide bicycle routes.

Issue: North Carolina's bicycle route system was developed in response to the 1974 Bicycle and Bikeway Act. The bicycle route system located those roads across

North Carolina that were safer for bicycling, designating a network of "Bicycling Highways" that provided access to small towns, state parks, historic sites, and other points of interest. The current network consists of nine different routes covering 2,400 miles. The 700+ mile NC 2 Mountains to Sea route is the main artery of the system, connecting east and west as well as most of the system's routes. Bicycle tourists and adventurers use maps created for each route to navigate the state.

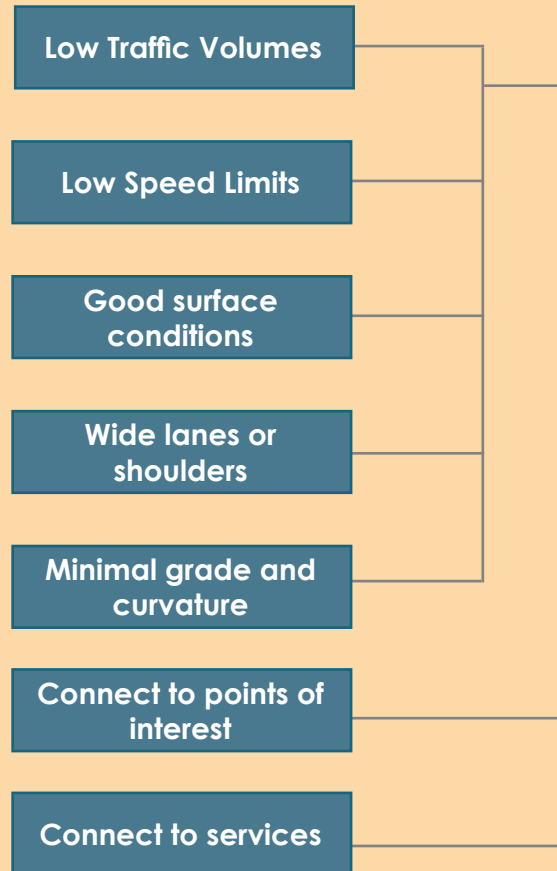
Given the extensive development that has occurred across North Carolina since the 1970's and associated changes to the roadway network, NCDOT recognized the need to re-evaluate and update the state bike route system as part of this 2013 plan. State bike route signage has generally not been maintained and is missing in some locations. There are also new opportunities to modernize the system by connecting to new regional and adjacent-state routes and destinations, enhancing wayfinding, and creating easily-accessible route mapping and information technology.



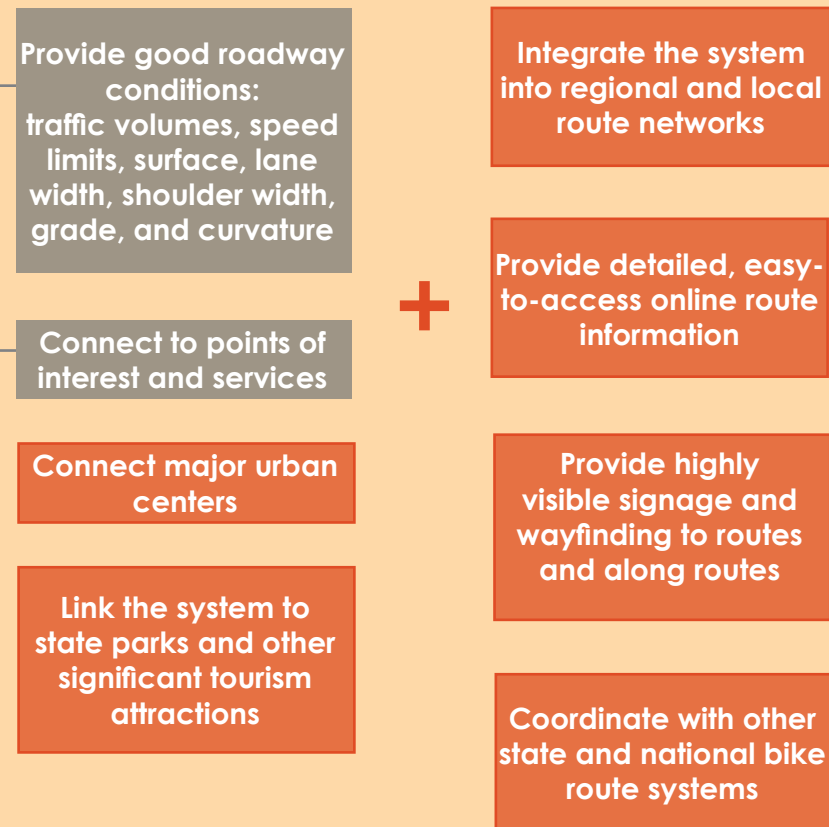
- ▲ Project planners collected input on the statewide bicycle routes by interviewing those who use them most.

North Carolina Statewide Bicycle Route System Goals: 1975 vs. 2012

1975 System Goals

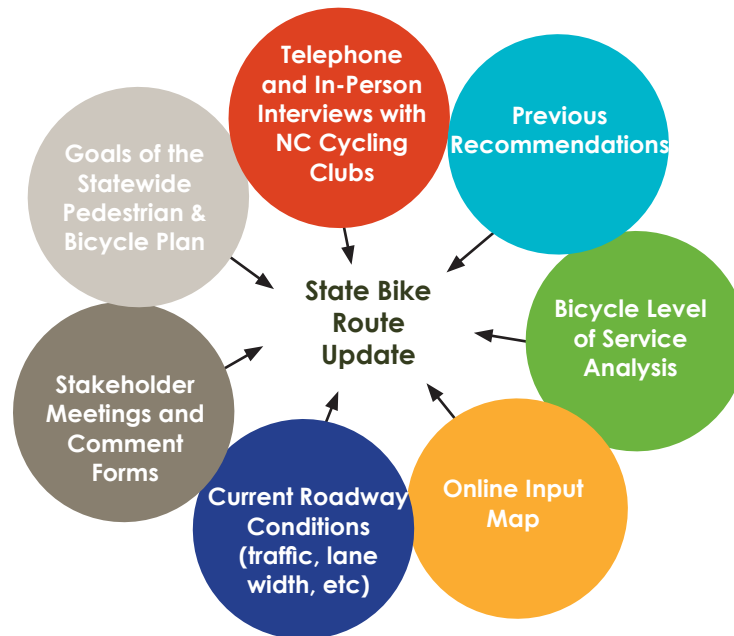
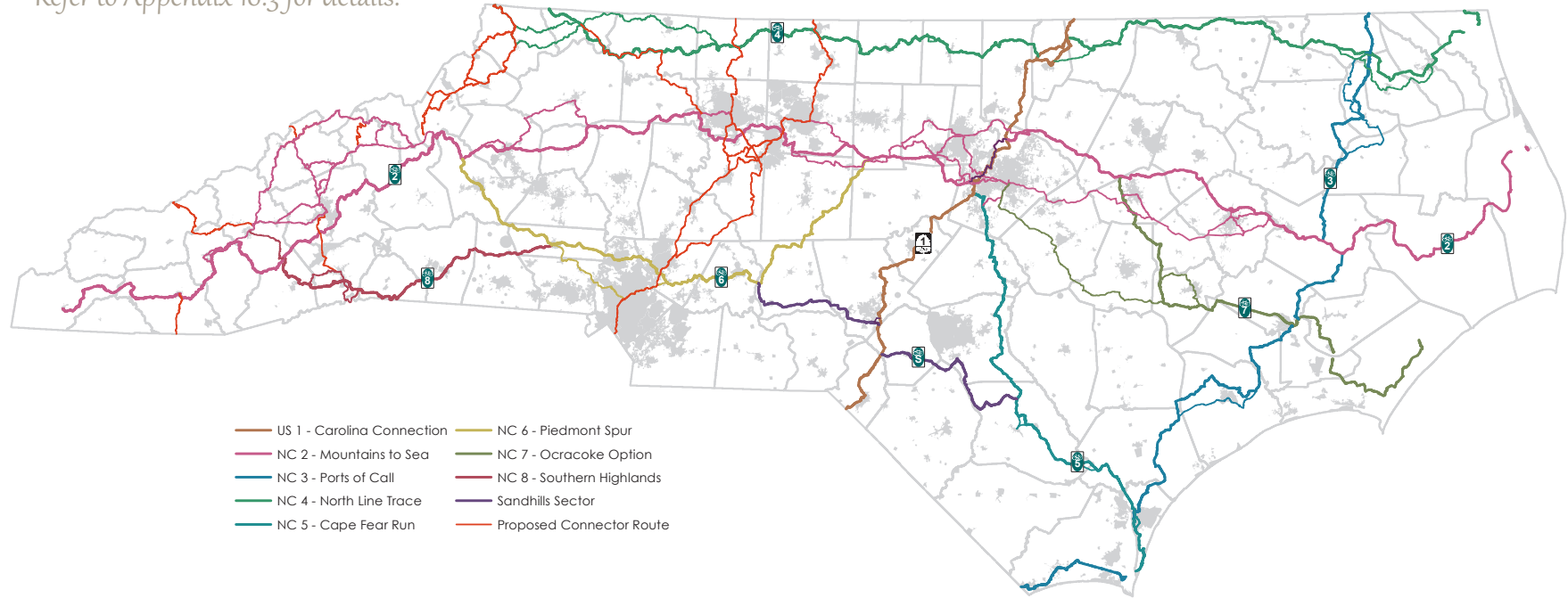


2012 System Goals



NC Statewide Bicycle Routes (Existing and Proposed Alternatives)

Refer to Appendix 10.3 for details.



An extensive stakeholder and public outreach process was conducted to determine areas of safety concern and potential route modification. The figure at left details the many inputs used during that process. A quantitative, data-driven analysis was combined with qualitative, stakeholder-driven input to ensure a complete evaluation.

Key input received from stakeholders for the new bicycle route system include:

- Re-route where development has changed the character of the existing routes
- Routes should include bicycle facilities
- Routes should connect major cities in North Carolina

- Ensure routes link to necessary amenities
- Routes should be clearly marked for both cyclists and motorists, and easy to follow
- Route information should be easy to access, up to date, and available online

Policy Direction: NCDOT should maintain the core state bicycle route system that was established in the 1970s, but re-route it in some location in keeping with the original intent of the system in order to provide better connectivity to North Carolina cities. The routes should also be modernized to update signage and mapping technologies. NCDOT should also prioritize improvements to statewide bicycle routes with the goal of providing paved shoulders along all state routes.

Action Items

- Route changes should be made based on qualitative and quantitative analysis performed as part of this statewide planning effort.
- State “business routes” should be developed to complement bicycle routes where they avoid cities.
- Consideration for wayfinding signage and maintenance of signage should be explored.
- Market the NCDOT “Contact Us” and “DOT4YOU” system to improve online form for individuals to report missing signs. Additionally, NCDOT should designate one point person within the Bicycle and Pedestrian Transportation Division to field these reports and communicate them to the appropriate division.
- Route information, mapping, and wayfinding should be made available through Internet and smartphone applications.

- Roadway improvements should be prioritized along state bicycle routes to provide paved shoulders.
- Connectivity should be improved between state parks and natural areas.

6. Rail-Trails Projects

Issue: Rails-to-trails and Rails-with-trails are effective and efficient approaches to providing bicyclists and pedestrians with connected facilities for commuting and recreating that are separated from motorized traffic. These trails can parallel existing railroads within the railroad corridor (rails-with-trails) thus providing an alternative transportation option and multi-modal connectivity; or they can be built atop inactive railroad corridors through the federal process of railbanking (rail-to-trails) making for an efficient interim use of the former rail right-of-way. Both types of trails offer scenic and favorable topography. Rail-trail projects continue to expand on the benefits of the five-pillars—health, economics, stewardship, safety and transportation.

Implementation of rail-trail projects is made difficult by the number of different players involved in the process of acquiring and implementing a trail in the railroad right-of-way. These stakeholders include various railroad operators, NCDOT Rail Division, rail-trail advocacy groups, adjacent property owners, and the local community. Coordination between these groups, often with conflicting interests, can be difficult, and creates one of the largest barriers to trail implementation and maximizing the potential benefits of these corridors.

Some of the other issues that impede rail-trail implementation are: railroad company disinterest in negotiating right-of-way purchase of inactive lines; private property encroaching on inactive railroad easements; dissent of private property

owners adjacent to rail corridors; liability concerns with public safety on rail-trails; and various design barriers to providing safe bicycle/ pedestrian crossings of railroad and roadway rights-of-way.

Policy Direction: Increase the consistency, efficiency and success of rail-trail projects in North Carolina. This can be accomplished by improving the coordination between various interest groups involved in these projects and by providing documentation of best practices and protocol that can serve as a guide to rail-trails statewide.



▲ The American Tobacco Trail in Durham, Wake, and Chatham counties, is a 22-mile rail trail.

Action Item:

- A. On a local level, involve the extensive list of stakeholders through a technical advisory committee or frequent communication via meetings, newsletters, phone calls, and e-mails, created uniquely to best fit the needs of each community and its respective stakeholders. Stakeholders may include railroad companies

(including representatives of real estate, operations, maintenance, and legal departments), utility companies, law enforcement officials, other adjacent landowners, trail user groups, and North Carolina agencies including transportation, health, and parks and recreation.

- B. Formalize a task force of rail-trails stakeholders that play a role at a state-wide level, including members from NCDOT, NC Division of Parks and Recreation, NC DHHS, railroad operators, NC Rails Division and North Carolina Rail-Trails group. This task force should research, monitor, and notify communities of inactive or potential abandonment status of NC rails.
- C. Host an annual North Carolina Trails Summit that brings together various stakeholders and provides a forum to discuss and define mutual roles and set a direction for creating a connected network of rail-trails in the state.
- D. Create a North Carolina Rail-Trails Guide that establishes best practices in planning and design, based on states with impressive mileage of rail-trails; the guide should also include a description of the necessary processes and roles and responsibilities of stakeholders. This guide will streamline the process of rail acquisition for trail purposes and provide recommendations for next steps. This report can also include a vision for the state's network of trails and goals for rail-trail projects.
- E. Find a political champion who works at a state level to support efforts towards extending the trail network, specifically emphasizing the potential for rail-trail projects in the state. Have this high-level supporter launch an initiative for a connected trail system in the state—setting the tone for interagency cooperation.

Case Study:

Michigan Rail-Trails

Michigan leads the nation in rails-trails projects. It has 126 rails-to-trails and rails-with trails in all parts of the state that collectively stretch 2,379 miles, according to the Rails to Trails Conservancy. The state partakes in a number of initiatives, programs and legal processes that contribute to this overwhelming success in rail-trail implementation.

Firstly, Michigan law mandates a “Right of First Refusal,” stating that abandoned rail lines must first be offered respectively to both Michigan Department of Transportation (MDOT) and the Michigan Department of Natural Resources (MDNR) before being sold to any other party. Rail corridors acquired by MDOT can be utilized for interim trail purposes. Putting rail corridors in the hands of the state DOT prioritizes the consideration of rail right-of-way towards recreation and trails. MDOT also makes special consideration for short segments of rail, always look for additional opportunities to spin off these segments that may not be critical to the viability of the overall state system, and which may have some potential for use as a recreational trail.

The highly coordinated effort made by various agencies, organizations and businesses within the state contributes greatly to the success of Michigan's trail system. Local businesses in Michigan are frequent partners in the promotion of trail projects in their area; they understand the benefits of trails to their business and often provide grants, meeting spaces or the company's services discounted. “Friends” and advocacy groups, such as the Michigan Trails and Greenway Alliance,

support a project from inception to implementation—from funding to maintenance to education. After the trail has been established, MDOT works closely with MDNR to preserve the corridor for potential conversion back to rail use in the future.

Another important key to Michigan's success is the backing of state and local politicians, primarily Governor Jennifer M. Granholm. She launched the trails initiative called Discover Michigan Trails. As a part of this initiative, the state works with the

Michigan Natural Resources Trust Fund to link Michigan's trail system by building new trails and upgrading existing trails throughout the state. A 20-page report written by MDNR called “Michigan Trails at a Crossroads: A vision for Connecting Michigan” helps coordinate and concert action at a statewide level among the many participating organizations. This report is supplemented by a case

study funded by MDOT's Transportation Enhancement Program to assess the economic benefits of the Pere Marquette Rail-Trail. To face the difficult legal issues that arise with rail-trail projects, both MDOT and MDNR are backed by strong legal defense staff and training.

These relationships across state agencies, organizations and businesses were solidified through a statewide summit on the trail network that provided a collaborative forum for these stakeholders to discuss mutual roles in expanding the trail system, with special attention to utilizing rail corridors for trails. The summit also established twelve task forces comprised of a mix of stakeholders to focus on key issues.

MICHIGAN SUCCESSES:

- **Governor is a champion of trail efforts**
- **Launched trails initiative called Discover Michigan Trails**
- **Hosted a state summit to provide a forum for stakeholders to work together**
- **Established 12 interagency and organization task forces on key issues facing trails**
- **MDOT funded research to demonstrate economic benefits of rail-trails**
- **Provide MDOT and MDNR with strong legal defense specific to rail-trail projects**

7. Accountability

Issue: Existing benchmarks and performance measures for bicycle issues are limited and are not always tracked on a statewide basis.

Policy Direction: NCDOT should identify and track progress over time on the goals and objectives identified in this Plan. The agency should use a defined set of data to benchmark progress on a statewide level, as well as the local and division level.

Action Items

- A. Adopt the priority performance measures in Chapter 8 and collect baseline data to establish a starting point where data does not exist. For instance, evaluate usage of specific bicycle facility types (Count technologies should be considered).
- B. Coordinate data collection efforts with MPOs and local governments to ensure a coordinated and cohesive approach.
- C. Continue report card effort that assesses progress on the performance measures. Expand pedestrian and bicycle performance metrics.



5 Policies and Practices



North Carolina State Legislative Building

INTRODUCTION

Policies have the greatest long-term implications of any action that a government can take to alter its future conditions. Policies have a tremendous long-term impact on pedestrian and bicycle options, particularly in the areas of financing and land development-transportation infrastructure relationships.

North Carolina grants municipalities and counties their current levels of authority over land development practices; if a method of control isn't explicitly mentioned in the N.C. General Statutes, it likely would not pass a legal challenge. Hence, major policy changes, including new revenue-generation tools or changes to the Equity Formula used for distributing funding across the State, would need an action taken by the N.C. Legislature.

A number of policies reside internally within NCDOT or are embedded in lower tiers of government, either in ordinances or standards – or simply historic actions. For example, barely half (52.8%) of North Carolina municipalities that responded to a recent survey (n=73) stated that they required developers to reserve rights-of-way for planned pedestrian or bicycle accommodations. Over time, a lack of such a requirement would make interconnecting compatible land uses nearly impossible, both financially and politically.

Internal to NCDOT, a number of policy memoranda have addressed pedestrian and bicycle accommodations over the past two decades, but they have been loosely followed and enforced. The most recent 2009 Complete Streets Policy emphasizes that the agency is committed to “providing an efficient multi-modal transportation network in North Carolina such that the access, mobility, and safety needs of motorists, transit users, pedestrians, and bicyclists of all ages and abilities are safely accommodated.” The Complete Streets Design Guidelines, published in 2012, inform the design and implementation of complete streets elements as part of all ongoing and upcoming projects.

In this Chapter

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Existing Federal and State Policies

New Policy Direction

Policy Topics and Recommendations

Funding

Planning

Prioritization

Design Guidance

Roadway Maintenance

Legislation

Land Use and Transportation Integration

Existing Federal and State Policies

United States Department of Transportation Policy Statement on Bicycle And Pedestrian Accommodation Regulations and Recommendations (March 2010)

Policy Statement Summary: "The DOT policy is to incorporate safe and convenient walking and bicycling facilities into transportation projects. Every transportation agency, including DOT, has the responsibility to improve conditions and opportunities for walking and bicycling and to integrate walking and bicycling into their transportation systems."

Recommended Actions: "The DOT encourages States, local governments, professional associations, community organizations, public transportation agencies, and other government agencies, to adopt similar policy statements on bicycle and pedestrian accommodation as an indication of their commitment to accommodating bicyclists and pedestrians as an integral element of the transportation system. In support of this commitment, transportation agencies and local communities should go beyond minimum design standards and requirements to create safe, attractive, sustainable, accessible, and convenient walking and bicycling networks. Such actions should include:

- Considering walking and bicycling as equals with other transportation modes
- Ensuring that there are transportation choices for people of all ages and abilities, especially children.
- Going beyond minimum design standards
- Integrating bicycle and pedestrian accommodation on new, rehabilitated, and limited-access bridges
- Collecting data on walking and biking trips

- Setting mode share targets for walking and bicycling and tracking them over time"

-Ray LaHood, United States Secretary of Transportation

Key Pedestrian and Bicycle Policies in North Carolina

- Bicycle and Bikeway Act
- Bicycle Policy
- Bridge Policy
- Pedestrian Policy
- Administrative Action to include Greenways Plans
- NCDOT Bicycle and Pedestrian Planning Grant Initiative
- Complete Streets Policies

Bicycle and Bikeway Act (Adopted 1974)

The passage of the Bicycle and Bikeway Act of 1974, established North Carolina's program as the first comprehensive state bicycle program in the nation. The legislation granted authority for the North Carolina Bicycle Program (now the Division of Bicycle and Pedestrian Transportation) to undertake comprehensive bicycle planning and programming. The far-reaching legislation established provisions such as those supporting the legal definition that a bicycle is a vehicle; defined bicycle facilities as a bona fide highway purpose; and authorized the department to spend funds for these facilities. The Act also outlined duties and responsibilities that would enable the bicycle program, through policies, standards, and procedures to assist local governments in the planning, development and construction of bicycle facilities. The program was expanded to encompass pedestrian activities in 1992.



Bicycle Policy (Adopted 1978/Updated 1991)

In 1978, the North Carolina Board of Transportation adopted the nation's most comprehensive set of bicycle policies in response to the enabling legislation of 1974. These policies were unique at that time in that they detailed how the state DOT would institutionalize bicycle provisions into everyday departmental operating functions. They declared "bicycle transportation to be an integral part of the comprehensive transportation system in North Carolina" and formalized the inclusion of bicycle provisions in highway construction projects.

In 1991, the policy document was updated to clarify responsibilities regarding the provision of bicycle facilities on the 77,000-mile state-maintained highway system. The newer policy details guidelines for planning, design, construction, maintenance, and operations pertaining to bicycle facilities and accommodations.

Bridge Policy (Adopted August 1981, March 1985, and November 1994)

NCDOT's Bridge Policy establishes controlling design elements for new and reconstructed bridges on the state road system. It includes information to address sidewalks and bicycle facilities on bridges, including minimum handrail heights and sidewalk widths.

"Sidewalks shall be included on new bridges with curb and gutter approach roadways that are without control of access; in some cases, only one side may warrant a sidewalk. Sidewalks should not be included on controlled access facilities. A determination on providing sidewalks on one or both sides of new bridges will be made during the planning process according to NCDOT Pedestrian Policy Guidelines. Bridges within the Federal-aid urban boundaries with rural-type roadway sections (shoulder approaches)

may warrant special consideration. To allow for future placement of ADA acceptable sidewalks, sufficient bridge deck width should be considered on new bridges in order to accommodate the placement of sidewalks.

When a bikeway is required, the bridge shall be designed in accordance with AASHTO standard bicycle accommodations and North Carolina Bicycle Facilities Planning and Design Guidelines, to give safe access to bicycles where feasible."

Pedestrian Policy (Adopted 1993/General Updated 1999/Guideline Update 2000/General 2001)

A sidewalk policy was initially developed in 1993 whereby NCDOT may participate with localities in the construction of sidewalks as incidental features of highway improvement projects. Prior to this policy, NCDOT participation in sidewalk construction was limited to replacing sidewalks that were disturbed during road construction. Now, at the request of a locality, state funds for a sidewalk are made available as part of an incidental project if matched by the requesting locality, which will be responsible for maintaining the sidewalk. The need for Pedestrian Facilities is based on seven criteria: 1) Local Pedestrian Policy, 2) Local Government Commitment, 3) Continuity and Integration, 4) Location, 5) Generators, 6) Safety, and 7) Existing or Projected Traffic.

Key aspects and requirements of this policy are:

- The Department will pay 100% of the cost to replace an existing sidewalk that is removed to facilitate the widening of a road.
- Incidental Projects
 - The municipality or County must notify NCDOT about the desire for sidewalk and will be responsible

for evaluating need, public involvement, maintenance, and liability.

- The municipality is responsible for easement and utility relocation
- A cost sharing approach is used to demonstrate the Department's and the municipality's/county's commitment to pedestrian transportation (sidewalks, multi-use trails and greenways). The matching share is a sliding scale based on population as follows:

Municipal Population	NCDOT Participation	Local Participation
> 100,000	50%	50%
50,000 to 100,000	60%	40%
10,000 to 50,000	70%	30%
<10,000	80%	20%

Administrative Action to include Greenways Plans – (Adopted 1994)

In 1994 NCDOT adopted administrative guidelines to consider greenways and greenway crossings during the highway planning process. This policy was incorporated so that critical corridors which have been adopted by localities for future greenways will not be severed or cut off by highway construction.

NCDOT Bicycle and Pedestrian Planning Grant Initiative (Started 2004)

The NCDOT Division of Bicycle and Pedestrian Transportation and the Transportation Planning Branch created an annual matching grant program – the Bicycle and Pedestrian Planning Grant Initiative – to encourage municipalities to develop comprehensive transportation plans. This program was initiated in January 2004 and is currently administered through NCDOT-DBPT.

To date, a total of \$3.6 million has been allocated to 134 municipalities through this grant program. Funding for the program comes from an allocation first approved by the North Carolina General Assembly in 2003 in addition to federal funds earmarked specifically for bicycle and pedestrian planning through the Department's Transportation Planning Branch.

The Division of Bicycle and Pedestrian Transportation expanded its municipal planning grant program in 2009, to include grants to councils of government for comprehensive regional bicycle plans. Funding had been set aside by the legislature in 2007 to begin this program.

Complete Streets Policy (Adopted July 2009)

The NC Board of Transportation approval of the Complete Streets policy, in 2009, required planners and designers to consider and incorporate multimodal alternatives in the design and improvement of all transportation projects within a growth area of a municipality. The policy expresses the need to develop an efficient multimodal transportation network for all transportation users, motorists, transit users, pedestrian and bicyclists of all ages and abilities; that meets their needs for safe access and mobility throughout the accommodation; while caring for the built and natural environments by promoting sustainable development practices that minimize impacts on natural resources and community values and sites of interest.

New Policy Direction

Moving forward, NCDOT should be guided by the following new pedestrian and bicycle policy statement, drawn from VDOT's policy:

The North Carolina Department of Transportation (NCDOT) will initiate all highway construction projects with the presumption that the projects shall accommodate bicycling and walking. Factors that support the need to provide bicycle and pedestrian accommodations include, but are not limited to, the following:

- A. Project is identified in a transportation or related plan.
- B. Project accommodates existing and future bicycle and pedestrian use.
- C. Project improves or maintains safety for all users.
- D. Project provides a connection to public transportation services and facilities.
- E. Project serves low income, children, people of color, older adults, and people with disabilities with limited transportation options.
- F. Project provides a connection to bicycling and walking trip generators such as employment, education, retail, recreation, and residential centers and public facilities.
- G. Project is identified in a Safe Routes to School program or provides a connection to a school.
- H. Project provides a regional connection or is of regional or state significance.
- I. Project provides a link to other bicycle and pedestrian accommodations.
- J. Project provides a connection to traverse natural or man-made barriers.
- K. Project provides a tourism or economic development opportunity.

This statement provides the framework for implementing the policy recommendations outlined below.

POLICY TOPICS AND RECOMMENDATIONS

Funding

Issue: The most far-reaching body of policy doctrine is associated with financing of pedestrian and bicycle infrastructure. Previous funding levels for pedestrian and bicycle programs in North Carolina will not be sufficient to meet the goals of this Plan and the expressed needs of North Carolina governments and citizens. NCDOT allots \$6 million annually towards independent pedestrian and bicycle projects. But it is important to keep in mind that \$6 million is, relatively speaking, not a large sum of money for a state transportation budget. If that same amount had been spent on independent pedestrian and bicycle projects between the years 1990 and 2003, it would have amounted to less than 0.8% of 349 roadway improvement projects (including widenings, climbing lanes and other improvements in addition to new location projects) completed during this same time period.¹

Regarding transportation equity, pedestrian and bicycle projects receive an inequitable share of transportation funding. However, pedestrian and bicycle projects provide greater transportation equity and benefits to diverse communities that have limited access to cars for mobility.

One way of identifying a fair amount of financing would be to consider the trip share of each mode of travel and to apportion available funds accordingly. In 2009, pedestrian and bicycle trips accounted for approximately 11.9% of all trips being made nationwide. Even adjusting the funding amount to reach the 2% of work trips being made in North Carolina in 2010 by walking and biking modes would require

¹ Hartgen, David T., "Cost-Effectiveness of North Carolina's Major Road Projects," John Locke Foundation. September 22, 2004.

increasing by seven times the amount of funds being spent each year (to approximately \$40 million). Perhaps as importantly for NCDOT and its customers, these funds could potentially reach many more communities than an equivalent amount of roadway expenditures.

Construction costs for sidewalks, greenways, and other pedestrian and bicycle core infrastructure is shared with local government on a sliding scale based on the population of the local government under the assumption that larger communities can bear a larger burden of the costs. Funding is also required for maintenance, which is almost universally limited to municipal governments in the case of pedestrian and bicycle infrastructure like greenways and sidewalks. There are several issues with this long-standing policy:

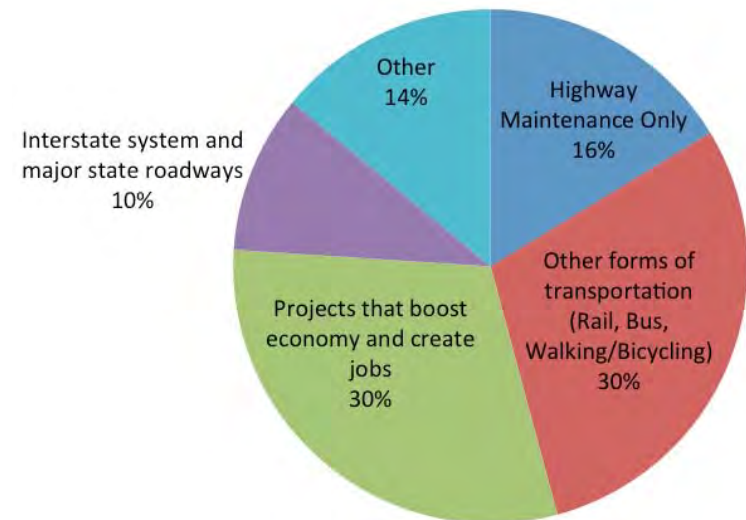
- First and foremost, roadway projects are not treated in this fashion – nearly 100% of the costs of roadway construction (except for utility relocation) are borne by NCDOT.
- The arguments for cost-sharing are tenuous, at best. Arguing that many recreational trips are made on pedestrian and bicycle facilities fails to recognize that the same is true of roads: only about 20% to 25% of all trips are commuting trips.
- Cost-Sharing promotes a mindset that pedestrian and bicycle facilities are optional, and not really part of a complete streets mindset that NCDOT is now trying to invoke.
- The current cost-sharing scale may still be too high to influence small towns or rural communities to get sidewalks.
- Finally, federal legislation Map-21 has introduced new policies and programs that must be incorporated into NCDOT's day-to-day operations. This includes some significant changes in how funding for pedestrian and

bicycle programs is distributed.

Policy Action Items:

- Provide sufficient funding for pedestrian and bicycle infrastructure by relating revenues to mode share, MPO/RPO/municipality expressed need, and public opinion more than ad hoc allotments (NCDOT; NCBOT).
- Develop better tracking of pedestrian and bicycle costs and revenues (NCDOT) to determine amount of funding going towards pedestrian and bicycle incidental projects.

NC Citizen's Preference for NCDOT Funding Distribution (from NCDOT 2040 Plan, survey of 3,500 citizens) ▼



- Establish streamlined processes for various partners to cost share and establish formal recognition that municipalities can fund projects outside of their jurisdiction (NCDOT; League of Municipalities).

Economic Impact of Pedestrian and Bicycle Infrastructure Investments

Positive economic impacts of walking and bicycling investments include upfront construction stimulus, ongoing use/tourism, direct use value, health care cost reduction, and commuting gains (reducing traffic congestion).

Investing in walking and bicycling paths and lanes stimulates the local economy by generating tourism revenue, supporting local business, and creating jobs. In the Outer Banks, a one-time public investment of \$6.7 million in paths and wide paved shoulders has generated \$60 million in annual tourism revenue from bicyclists.

Relatively low-cost walking and bicycling improvements generate a high return on investment and job creation. According to a report from the Policy Economy Research Institute at the University of Massachusetts Amherst, bicycle projects create 11.4 jobs for every \$1 million invested (46% more than car-only road projects). Pedestrian-only projects create 10 jobs per \$1 million while roadway projects create 7.8 jobs per \$1 million. See *Appendix 10.5 Economics* for detail about estimated economic impacts of implementing this Plan.

- D. Consistent with the new Complete Streets Policy, revamp policies that previously required local sponsors to pay for pedestrian and bicycle improvements that were incidental to roadway projects. The policy may still require a local match, but it shouldn't single out pedestrian and bicycle facilities separately.
 - 1. Toward this end, consider revising the cost-sharing approach to financing pedestrian and bicycle projects, including requiring pedestrian and bicycle-supportive land development best practice for communities that are unable to pay a full share of the cost for pedestrian and bicycle infrastructure such as cross-access, parking, setbacks, requirements for connectivity, traffic impact study guidelines that address multimodal factors, mixed-use development, form-based code elements, and site review practices that contemplate pedestrian and bicycle needs (NCBOT; land development department of university; ITRE).
- E. Document the process by which infrastructure recommendations in local and regional pedestrian and bicycle plans will be incorporated into the funding process at the state level.
- F. Continue to supplement pedestrian and bicycle program funds with Surface Transportation Program (STP) funds sufficiently to meet the goals of this Plan.
- G. Assign Highway Safety Improvement Program funding proportionately to the percentage of pedestrian and bicycle crashes in North Carolina.
- H. Make 100 percent of Transportation Alternative Program (TAP) (Map-21) funds available for eligible activities. These funds should not be redirected to other programs.
- I. Investigate options to assist low income communities with providing match to federal funds.
- J. Work with smaller communities lacking resources to help administer and deliver projects.
- K. Seek innovative funding opportunities such as:
 - 1. Public-private partnerships
 - 2. Regional projects
 - 3. Multi-agency and multi-objective collaboration
- L. Consider policy change to fund pedestrian and bicycle projects outside municipal boundaries when they meet certain conditions of demand.

Planning

Issue: There are new opportunities for advancing pedestrian and bicycle planning efforts beyond the success of the Planning Grant Initiative started in 2004. For example, after funding and completing 134 pedestrian and bicycle plans, an opportunity exists to plan pedestrian

and bicycle infrastructure for strategic, small areas and corridors. ADA transition planning, a federal requirement, has been largely absent from the planning and design efforts exhibited across the State as well.

In addition, there is a lack of consistency across NCDOT divisions in terms of following recommendations from Long Range Transportation Plans (LRTPs), Comprehensive Transportation Plans (CTPs), and locally adopted pedestrian and bicycle plans. A consistent approach and balance is needed so that these planning efforts and documents do not conflict or override one another.

Policy Action Items:

A. Modify DBPT pedestrian and bicycle planning grant program to accomplish the following:

1. Continue pedestrian and bicycle planning grants.
 - Notify communities to update their plans every five years (re-application already allowed after five years).
 - Notify communities who do not have pedestrian and bicycle plans to apply for grants.
 - Allow communities with less than 25,000 in population to develop combination pedestrian & bicycle plans (Currently, communities of less than 5,000 population may apply for combination plans).
 - Streamline process and Plan outlines currently prescribed for pedestrian and bicycle plans to reduce costs and provide to more communities.
2. Create grant for ADA transition planning.
3. Develop corridor/small area planning grants for pedestrian and bicycle improvements.

4. Maintain regional planning initiative especially geared towards rural counties where municipality resources are limited.
 5. Develop program grants for municipalities to lead local education, encouragement and enforcement efforts.
 6. Require local division staff to participate actively in pedestrian and bicycle planning process, potentially as plan steering committee members.
 7. Increase the funding levels for this grant program.
- B. Ensure that 'premier' projects are identified by their potential regional impact; dedicate sufficient funding to connect existing systems to schools and other, local projects (NCDOT).
- C. Locally-adopted pedestrian and bicycle plans should supplant CTPs when local division staff consider project development and implementation. CTPs should reference and defer to locally adopted pedestrian and bicycle plans when they exist.
- D. CTPs should include further detail (often featured in pedestrian and bicycle plans) to be of greater use in implementation. In many cases, CTPs are the only level of pedestrian and bicycle planning completed, especially in rural areas. NCDOT DBPT and the Transportation Planning Branch should work together to modify their recommendation map symbology to be more informative and comprehensive.

Prioritization

Issue: The NCDOT prioritization process for pedestrian and bicycle projects has evolved each year since 2009 from Prioritization 1.0 to 2.0 to 3.0. There remains opportunity to continue enhancing the prioritization criteria. With an

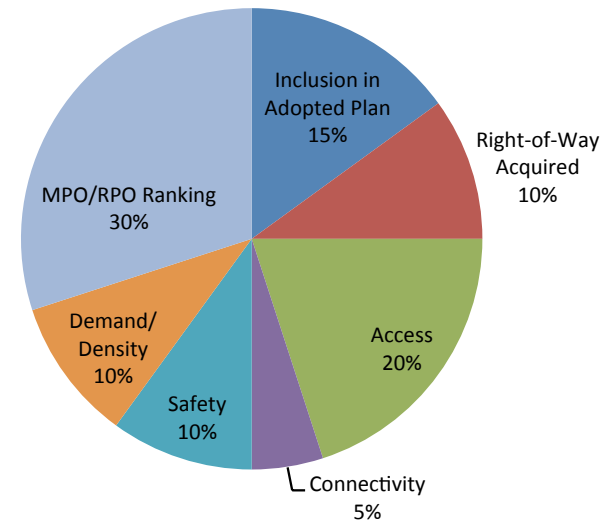


increased agency focus on the health of North Carolina citizens (and better collaboration between NCDOT and DHHS), there is an opportunity to include equity issues. Social and health equity issues should weigh into the decision-making process, especially since walking or biking may be the only way low-income citizens can access jobs, schools, or medical care. An emerging trend, particularly important in North Carolina with high rates of physical inactivity and obesity in adults and especially children, is the inclusion of a health impact assessment (HIA) that is appropriately scaled to each project's footprint/impact so as to not unnecessarily weigh down the NEPA or other project planning processes further.

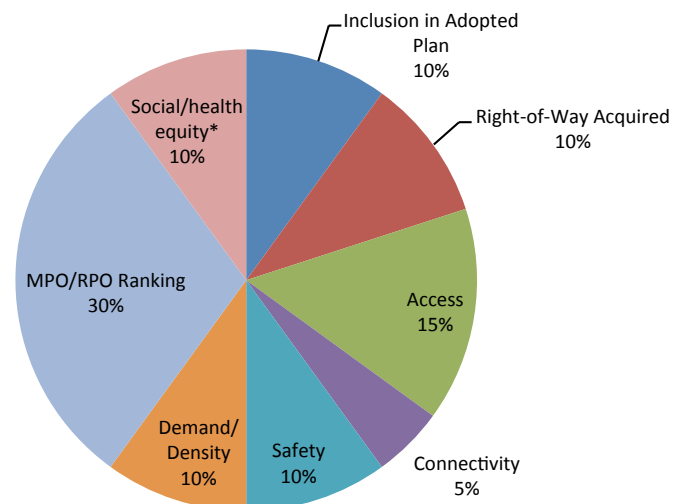
Policy Action Items:

- Establish Pedestrian and Bicycle Quality Level-of-Service prioritization factors, e.g., Q/LOS Model (NCDOT; ITRE; private consultant)
- Implement health factor requirements for ranking projects that are appropriately scaled to project or plan size (NCDOT; ITRE; Active Living by Design)
- Create a social equity prioritization factor, but let it be balanced with community needs (NCDOT; ITRE; DHHS). DHHS will need to provide useable data at appropriate geographic scale.
- Create an economic impact prioritization factor when data and analysis is available.
- Implement emerging national guidance regarding the prioritization of pedestrian and bike infrastructure over time.

▼ Current NCDOT Prioritization Categories for Pedestrian and Bicycle Projects (Prioritization 3.0)



▼ Recommended NCDOT Prioritization Categories for Pedestrian and Bicycle Projects (with the addition of a 'Social/Health Equity' category)



▼ Recommended NCDOT Prioritization Process for Pedestrian and Bicycle Projects

RIGHT-OF-WAY ACQUIRED			Max = 10
50% to 74%			3
75% to 94%			7
95% to 100%			10
ACCESS			Max = 15
(A) Destination Type			8 (Max)
Municipal center, transit station, major employment center, mixed use commercial, universities, regional trail systems (East Coast Greenway, Mountains-to-Sea Trail, Carolina Thread Trail), state bicycle routes			2 per destination
Multi-family and high-density residential developments, schools, local and state parks , bus stops, park and ride lots			1 per destination
(B) Distance to Prime Destination			7 (Max)
Pedestrian (miles to destination)		Bicycle (miles to destination)	
0.0 to 0.25		0.0 to 1.0	7.5
0.26 to 0.5		1.01 to 3.0	6
0.51 to 1.0		3.01 to 5.0	5
1.01 and more		5.01 and more	2.5
CONNECTIVITY			Max = 5
If a candidate segment 1) links at both ends to existing pedestrian/bike facilities, 2) has multiple connections to an existing pedestrian/bike facility, or 3) connects to a regional trail or the statewide bicycle route system			5
If the segment connects at one end to an existing pedestrian/bike facility or has one connection to an existing pedestrian/bike facility			3
INCLUSION IN AN ADOPTED PLAN			Max = 10
bicycle plan, pedestrian plan, greenway/multi-use plan, SRTS action plan, regional or statewide trail plan, state bicycle route			7
comprehensive plan, LRTP, or CTP, but not included in an adopted bike or greenway/multi-use plan			3
SAFETY			Max = 10
(A) Crashes – Three or more bicycle/pedestrian/vehicle crashes within last 5 years along the corridor.			5 (for either A or B)
(B) Speed Limit – Posted speed on the roadway exceeds 35mph.			
(C) Project provides a separated facility from roadway			5 (for either C or D)
(D) Project design encourages a reduction in vehicular speeds (traffic calming, pedestrian refuges, restriping to narrow lanes, road diet, etc.)			
DEMAND/DENSITY			Max = 10
Persons per square mile – 2,251 and more			10
Persons per square mile – 1,501 to 2,250			7.5
Persons per square mile – 751 to 1,500			5
Persons per square mile – 0 to 750			2.5
MPO/RPO RANKING			Max = 30
#1 pedestrian/bike project	30	#6 pedestrian/bike project	15
#2 pedestrian/bike project	27	#7 pedestrian/bike project	12
#3 pedestrian/bike project	24	#8 pedestrian/bike project	9
#4 pedestrian/bike project	21	#9 pedestrian/bike project	6
#5 pedestrian/bike project	18	#10 pedestrian/bike project	3
SOCIAL/HEALTH EQUITY			Max = 10
Candidate segment connects low-income community, children, older adults, people with disabilities (US Census)			5
Candidate segment connects to community with high incidences of obesity, physical inactivity, heart disease (DHHS data)			5

Bold/italics indicate this Plan's recommended updates and additions to 'Prioritization 3.0'.

Before 'Social/Health Equity' was recommended, 'Access' had a maximum of 20 points and 'Inclusion in an Adopted Plan' had a maximum of 15 points.

Updates to prioritization are informed by focus group meeting input received during this planning process.

Inclusion of health/social criteria will require data-sharing from DHHS of data of useable geographic scale.

In the long-term, an economic impact criteria should be considered.



Design Guidance

Issue: As mentioned earlier, the advent of a complete streets policy and guidelines was a major advancement for pedestrian and bicycle supporters. The way in which complete streets is implemented at the division/district office levels and Roadway Design will be crucial to its ultimate success. These guidelines do show basic cross-sectional information, but could be enhanced with intersection, constrained rights-of-way, and bridge/structural contextual information. Perhaps most importantly, the “complete streets paradigm shift” has to occur to the point where pedestrian and bicycle facilities and accommodations are considered simultaneously with and in equal importance to automobile carriageways.

Existing pedestrian and bicycle design policy and guidance is dispersed in many different documents and directives of NCDOT. It tends to lack sufficient design level and at times does not reflect the latest design guidance and national best practice. There are instances where guidance from different sources is conflicting or inconsistent. These issues are highlighted briefly below.

- *Disbursed design policy and guidance:* Existing pedestrian planning and design guidance is disbursed throughout numerous sources, including design guidelines, the Roadway Design Manual, and policy memoranda. It is not always clear which design guidelines reflect NCDOT’s official policy and there is variation across the state regarding the interpretation of existing planning and design policies.
- *Level of detail:* Existing guidance, including the new Complete Streets Guidelines, are generally high-level discussions of pedestrian and bicycle design strategies. More detail is needed for designers to clearly understand how to implement these strategies.
- *Conflicting guidance:* Existing sources are not always aligned and at times are directly in conflict with the Complete Streets Guidelines.
- *Dated Design Guidance:* Existing pedestrian and bicycle policies and design guidance do not always reflect the latest design guidance and national best practices. Toolboxes of pedestrian and bicycle facilities are limited.
- *Implementation Process:* The existing pedestrian and bicycle infrastructure development process is not always leading to the outcomes that are envisioned in the Complete Streets Design Guidelines.

The complete streets policy and design guidelines provide the “big picture” vision moving forward; the next step will be to update all sources of design guidance to provide more detail, ensure consistency, and better align them with the complete streets policy and guidelines. More guidance and design details should be provided to make the guidelines easier to implement at the project level. Additionally, targeted changes to the existing pedestrian and bicycle infrastructure development process should be implemented to ensure better outcomes.

Policy Action Items:

- A. Conduct a comprehensive comparative assessment of current policies and identify and correct conflicts and deficiencies. For example, the current landscape policy contradicts the Complete Streets Design Guidelines with regards to setback requirements and the use of landscape buffers. Additionally, the Sidewalk and Pedestrian Policy is not fully aligned with the goals and approach set forth in the Complete Streets Design Guidelines.
- B. Unify the current policies into a comprehensive, single

set going forward and incorporate this information along with the new policy statement highlighted earlier in this chapter.

- C. Develop a strategy and timeline for updating all state design resources to comply with guidance provided in the Complete Streets Design Guidelines.
- D. Clarify pedestrian and bicycle needs on bridge structures in urban, rural, and transitioning areas that reflect the lifespan of bridges (NCDOT).
- E. Update the *Roadway Design Manual* (RDM): The RDM should be updated to ensure that the design details contained within are aligned with the Complete Streets policy. The RDM should incorporate and build upon the complete street typology in the *Complete Streets Design Guidelines* and to provide more detailed,

prescriptive guidance on pedestrian and bicycle facility design. Design guidance does not need to address every possible scenario, but should address the most common urban, suburban and rural scenarios. The RDM will need to comprehensively address issues such as funding, rural treatments, latent demand, and access to transit. See the table below for detailed recommendations related to the RDM.

- F. Update NCDOT Bicycle and Pedestrian Facility Guidelines by working with DENR, Division of Water Quality (DWQ) and multiple departments within NCDOT (including Hydraulics) to ensure coordination and agreement on facility types such as greenways.
- G. Conduct audits of Complete Streets implementation and compliance with Complete Streets.

Recommended Updates to the Design Process and Roadway Design Manual	Details
Include a list of the current authoritative source for pedestrian and bicycle planning and design elements.	Similar to the Wisconsin Department of Transportation, the RDM should include a consolidated list of the current authoritative source for the full range of existing pedestrian and bicycle planning and design elements in North Carolina. This section should highlight when and where specific policies were overwritten by newer policies. It should clarify the relationship between pedestrian and bicycle plans at the state, regional, and local levels. It should also document the difference between official policies and standard institutional practices.
Develop design guidance that explains the appropriate use and how to design various complete streets elements.	Ensure that Complete Streets v. 2.0 and the Roadway Design Manual contain the latest thinking on bicycle and pedestrian facilities. It should cite relevant portions of the <i>AASHTO Guide for the Development of Bicycle Facilities</i> , <i>NACTO Urban Bikeway Design Guide</i> , the <i>MUTCD</i> , and other resources. In addition to highlighting local examples throughout, it should also include context and design considerations such as crash mitigation factors and relevant research. Additional information on this recommended design toolbox resource within the RDM is provided as Chapter 6.
Include standard cross sections	Include standard street and roadway cross sections and other technical details that clearly indicate all travel modes.
Provide information and instructions on cost sharing agreements for roadway projects.	It should be clear that pedestrian and bicycle facilities will no longer be treated as standalone elements to be funded separately, but an integral component of the project.



Provide more detail on the collaborative process	View the collaborative process outlined in the <i>Complete Streets Design Guidelines</i> as a starting point.
Provide a set of Design Principles to clarify the design approach and process at all levels of NCDOT.	The California DOT has developed a set of design guidelines that can be used as reference. Examples of their general design principles include designing pedestrian paths to be as direct as possible, expecting pedestrians to travel anywhere it is legal, reducing crossing distance to reduce exposure to crashes, and using design treatments to clarify who has the right-of-way.
Provide clear guidance regarding the inclusion of Complete Streets elements in projects already programmed in the Transportation Improvement Plan (TIP).	<p>The agency should develop a matrix that clearly outlines whether and to what extent projects can be changed to better meet complete streets objectives. Elements of such a policy directive will likely include:</p> <ul style="list-style-type: none"> • Any project that has not yet reached the design public hearing stage should be updated to incorporate complete streets elements. • Projects that are past the design public hearing stage can still be changed, but there are practical limitations on how much they can change. • For example, lane diets and road diets can potentially still be accommodated, but the curb lines and amount of right-of-way to be obtained will not likely change after the design public hearing stage. <p>Real world project examples should be referenced for clarification. For example, a recent project in Boone, NC can serve as an example of a project that was reconsidered after the public hearing stage in order to narrow lanes and add bike lanes.</p>
Identify a strategy and approach for funding and implementing Complete Streets moving forward.	This will include outlining the approach for funding pedestrian projects, clarifying the role of local contributions, shifting away from the treatment of modal elements separately, and identifying a mechanism that ensures that small communities with limited resources will have access to complete streets projects.
Include official policy statements in areas such as lane widths, liability, and the preference for bike lanes over wide outside lanes.	For example, lane widths will be encouraged to be narrowed to enable the inclusion of bike lanes and wider paved shoulders during road reconstruction and resurfacing projects and pedestrian and bicycle recommendations are encouraged to be included on NCDOT roads in local and regional plans.
A standard protocol is needed to require a proactive review of lane widths and capacity during new construction, reconstruction and resurfacing projects with the purpose of determining if bike lanes or wider paved shoulders can be implemented as a part of the project.	<p>This will provide a cost effective method of improving conditions for all modes on NCDOT roadways, without compromising safety for other users. The official protocol should provide general guidance on locations where lane diets (reducing travel lane widths) and road diets (removal of travel lanes) may be an option during retrofit projects. The 2012 AASHTO Guide for the Development of Bicycle Facilities should be referenced in developing this policy.</p> <p>Municipalities play an active role in reviewing resurfacing lists and agreeing on suggested changes; however, the primary responsibility for identifying and implementing lane and road diet opportunities will rest with NCDOT. Appendix 10.6 presents design considerations for lane widths on state-owned roads in North Carolina. It includes a review of current lane width guidance and relevant research.</p>

Develop and publish new crosswalk marking guidelines consistent with the MUTCD.	The guidelines should identify additional measures that will be taken to ensure uncontrolled crossings are safe, including the use of median islands, advance stop bars, rapid-flash beacons, yield to pedestrian bollards, pedestrian hybrid beacons, and other crossing measures.
Clarify the complete streets appeals process, only through exception	For example to document who can make appeals, what information is needed, how and to whom it should be submitted, and how appeals will be evaluated.
Establish a yearly budget for research and develop a process for identifying new projects each year, in partnership with local governments and universities.	Progressive DOTs that are leaders in terms of their work on pedestrian and bicycle issues have one thing in common – they are willing to invest time and effort into researching the best and most effective approaches. NCDOT has done this in the past, such as with the research studies that were conducted on the economic impact of bicycle facilities. North Carolina has many institutions of higher learning that could serve as partners in research efforts. Local governments are also interested in implementing innovative pedestrian and bicycle designs as pilot projects.
Document the relationship between the Complete Streets policy and the Main Streets program.	The goals of each program should be presented in relation to each other and potential conflicts should be identified. A detailed discussion of the Main Street program and its relationship to the Complete Streets policy should be provided.

5

Roadway Maintenance

Issue: The maintenance and operations of our transportation system keenly impacts pedestrian and bicycle travelers. Detector loops that are not set to detect modern road bicycles can create illegal or risky moves, while opportunities are missed altogether when a roadway is widened without considerations for the potential to improve pedestrian and bicycle travel. These maintenance activities, cumulatively, can make a much larger impact than changing the relatively few “new” projects identified on the State Transportation Improvement Program (STIP). Maintenance agreements with counties, and even schools or private sector partners, need to be explored to help cover the costs associated with both motorized and non-motorized forms of transportation infrastructure.

Policy Action Items:

A. Develop and promulgate standard maintenance

agreements and work with Division Offices to understand how they work and are applied to non-traditional partners (NCDOT; land planning institute at a university).

- B. Initiate local government and division/district staff to communicate about upcoming rehabilitation projects, and the importance of setting aside money in capital budgets to help with cost-sharing responsibilities. Establish a regular annual or biannual meeting to discuss upcoming projects. (NCDOT; local governments).
- C. Develop guidelines for setting magnetic induction loop detectors to increase the range of sensitivity to cyclists.
- D. Improve bicycle lane and paved shoulder sweeping programs as a collaborative effort between NCDOT and municipalities.

Legislation

Issue: While changing the N.C. General Statutes is a difficult and cumbersome process for even a state agency to undertake, in some cases such a change becomes necessary to create the desired effect in a system. North Carolina has enjoyed both recent and historical successes in making positive legislative transformations, and some policies that have been around a very long time could be re-examined. Some observers of this process noted that being inclusive in legal changes is important to success: passing laws make the roads safer for tractors as well as for cyclists.

A particularly difficult subject is the North Carolina State Equity Law, which essentially attempts to balance funding for transportation projects throughout the state (excluding Urban Loop Projects). Pedestrian and bicycle projects could be made exempt from the Equity Formula on the grounds of their individual and even collective costs; this would have the effect of making these projects more desirable for local governments that perhaps did not count them as heavily as roadway capacity projects. Similarly, revenue generation mechanisms like impact fees and transportation benefit assessment districts have been politically challenging. The continuing decline in real terms of federal and state revenues, as well as the current trend towards devolution of government responsibilities, will place pressures to increase the tools available for local governments to finance pedestrian and bicycle projects. Allowing authority to implement these measures, like the successful tax increment financing allowance, is possible and does not indicate an immediate rush to raise taxes or fees. Requiring these public funds to be matched dollar-for-dollar with other sources of revenue may

help balance the arguments levied against a new fee.

Finally, North Carolina is one of only five states that still have contributory negligence tort laws (Alabama, Virginia, Washington, D.C., and Maryland are the others). It is conceivable under this legal system to envision a situation where a cyclist that fails to have a rear taillight (a legal requirement in N.C.) and is subsequently struck head-on by a drunken motorist crossing completely over a center stripe would not be compensated for the injuries inflicted by the driver of the motor vehicle. Most states have some version of comparative negligence, where the degree of damages is related to the degree of fault of both parties. This situation has occurred in pedestrian and bicyclist court cases (or threatened to be introduced to reduce the amount of the settlement) and is a major barrier to sending clear messages to negligent drivers of the penalties related to their bad behavior. As with other legislative changes, changing this legal policy should benefit everyone, not just pedestrians and bicyclists.

Policy Action Items:

- A. Develop a slate of proposed changes to state legislation that deal with minimum three-foot passing requirements, lane positioning, and hand signaling;
- B. Change the contributory negligence law (note: this legislation should be considerate of all vehicles/users in rural areas to gain maximum partnership and momentum) (NCDOT; NCBOT; NC State Legislature; NCATA).
- C. Clarify State Equity Formula to exclude independent projects valued at under \$250,000 and all incidental projects (NCDOT; NCBOT; NC State Legislature).
- D. Develop slate of revenue generation methods for inclusion in North Carolina General Statutes that local governments can “tap” into.

LAND USE AND TRANSPORTATION INTEGRATION

Why this is Important to Walking and Biking

The integration of land use development infrastructure – or lack thereof – is a relevant, debated topic today across the United States. Simply put, planners and decision-makers in the 20th century (and to an extent, the 21st century) have segregated land uses and accepted sprawl and lack of connectivity as a primary way to grow communities. These separate land uses can often only be reached by car, even those that are complimentary like offices, shopping centers, schools, and neighborhoods. A better mixing of complimentary land uses can reduce trip lengths for all modes of travel, as well as reduce construction and operation costs for the provision of public services. As evidenced throughout this Plan, providing walkable communities can improve the health of North Carolina residents, promote economic growth, increase safety, and reduce automobile emissions.

Pedestrians and bicyclists are impacted directly by land use and transportation decisions which are often made separately. Walking and biking distances play a major role in one's determination of making that trip by foot or bicycle. Many studies have analyzed the willingness of Americans to walk or bike certain distances. In 2011, the Federal Transit Administration (FTA) established ½ mile as their catchment area for access to transit for pedestrians, and 3 miles for bicyclists. Another study found that the average walking trip length in the United States was 1.2 miles (with between 47% and 60% of walking trips less than 0.5 miles). The average trip length for bicycling is 4 miles and 57% of trips are less than 2 miles (Walking and Cycling International Literature Review, 2009, Dr Kevin J. Krizek, Dr Ann Forsyth, Laura Baum).

Macro-scale and micro-scale development patterns not only impact distances people have to travel to reach basic services, recreation, and work, but also impact connectivity and safety. Connected, grid street networks remain in most Downtowns in North Carolina but suburban development outside Downtowns resulted in disconnected, cul-de-sac neighborhoods connected by wide arterial roadways. These roadways often feature an excess of driveway entrances creating more conflict points for motorists, pedestrians, and bicyclists. The current environment presents a number of barriers making walking and biking not pleasant or safe options.

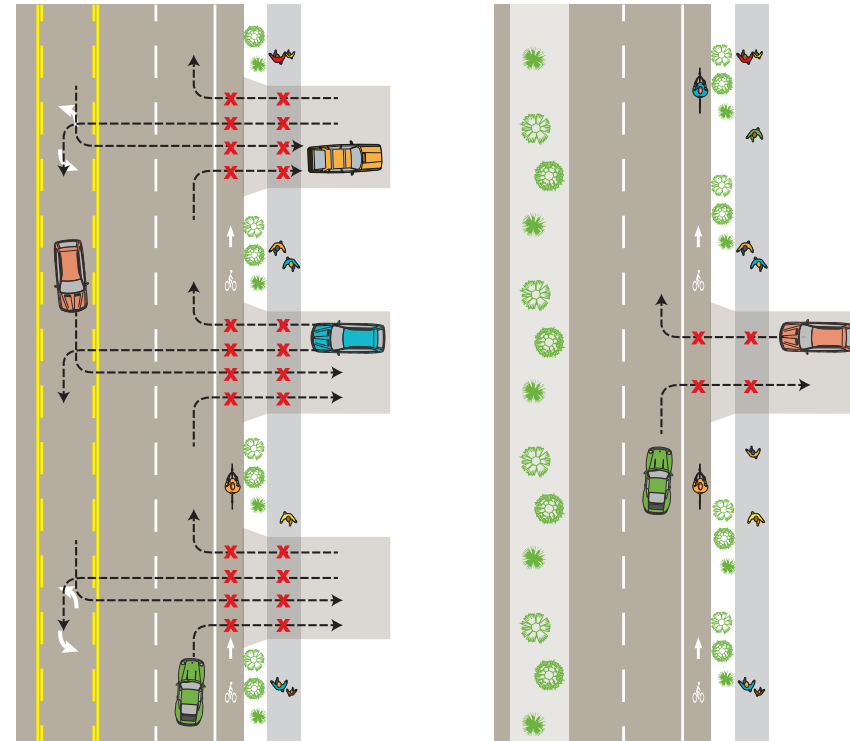
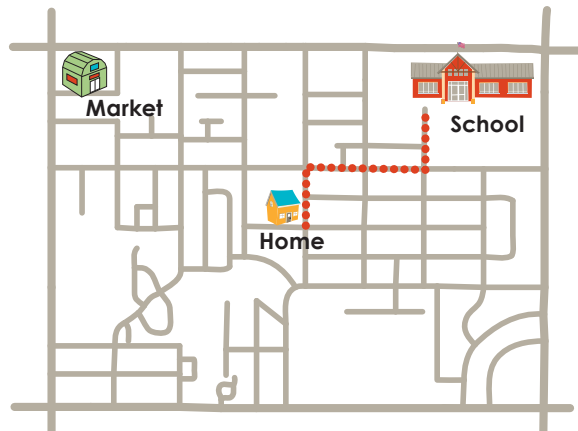
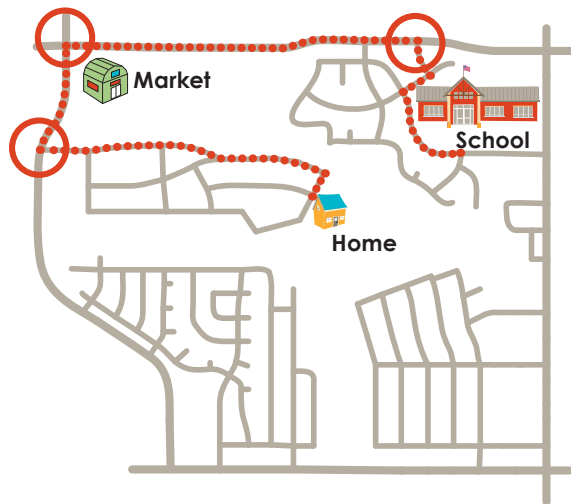
Often, the appearance and design of land uses are what makes them locally unacceptable. This fact has given rise to the development of "smart codes," or form-based code that emphasizes the forms, design, and spatial relationships to improve the value of surrounding properties, not just seek to do them no harm. Almost 20% of North Carolina municipalities that responded to a recent survey (n=72) stated that they already have some elements of form-based regulation in their land use plan now.

Places that are successful in achieving walkable and bikeable communities should be rewarded for their efforts in terms of waiving or reducing the cost-share for transportation facilities that resonate with the character of their community – hopefully these include making their communities attractive to younger residents that are looking for a return to places to make a home that don't require a car for every trip. It is in these places where new and expanded roadway infrastructure is likely to have the longest life, and where pedestrian and bicycle modes realize the greatest cost-effectiveness.



The NCDOT policy on 'Street and Driveway Access to North Carolina Highways' provides examples on how to reduce conflict points between motor vehicles and pedestrians and bicyclists. It also considers access management for both future development and retrofits to existing development: www.ncdot.org/doh/preconstruct/altern/value/manuals/pos.pdf

- ▼ Land use patterns and their associated street networks impact distances traveled by all users (see red lines in diagrams below). Even relatively small differences in a distance to a destination (as well as busy intersections shown in red circles) can impact the decision to walk, bike, or drive.



- ▲ Land use also affects the safety and comfort of pedestrians and bicyclists. The image above at left shows potential conflict points in red, due to the turning movements presented by multiple driveway access points combined with two-way center turn lane. This is a typical cross section in many of North Carolina's major suburban commercial corridors, often carrying the land use designation of 'highway commercial'. The alternative at right shows fewer conflict points, which can be accomplished by consolidating driveways, adding a landscaped median, and using other access management strategies.

Current Land Use Approach

In urbanized areas the Metropolitan Planning Organization (MPO) takes the lead on developing the Long-Range Transportation Plan, often called the Metropolitan Transportation Plan, with cooperation from NCDOT, local counties and communities. These local stakeholders provide data such as employment, goals, population growth and land use and this information is used to develop various modeling scenarios for the long-range transportation plan for the region. This cooperation should allow for establishing a comprehensive transportation plan, integrating land use with transportation planning and creating a common long range vision among the partners.

Land use planning is done by local communities to ensure that community character, local vision, goals and others are maintained and small area plans are sometimes completed to supplement the overall land use strategies of the communities. Funding for developing these local land use and small area plans are typically the local community responsibility. In larger urbanized area such as Charlotte, MUMPO provides staff to assist with local land use planning challenges typically associated with large cities. Currently, there is no funding within MUMPO to assist small communities to develop their land use or small area plans. There is funding, however, for pedestrian and bicycle plans and for construction projects.

The challenge with this process is the disconnect between transportation and land use policy. Since developing and implementing land use plans are the local communities' responsibility and most land use plans are not available due to lack of resources, long-range transportation planning is geared toward outdated land use plans. These land use planning efforts which essentially build on past efforts with incremental changes associated with current pressures being applied by market or political forces are

WHEN HOMES ARE FAR FROM JOBS, THERE'S A
MAJOR COST TO FAMILIES AND SOCIETY

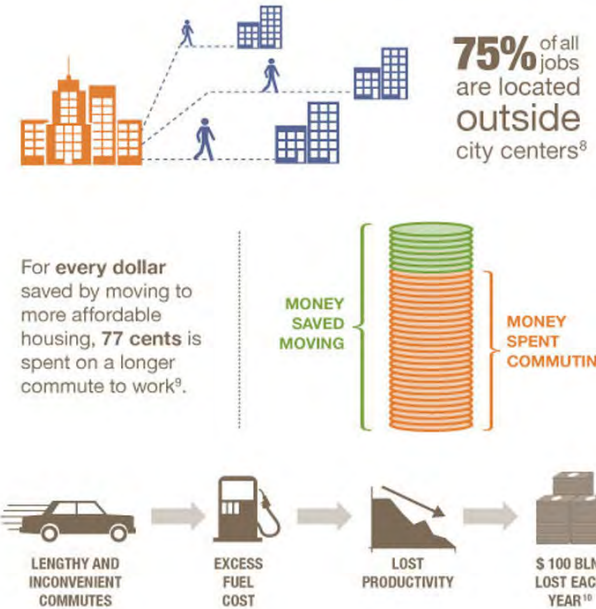


Image from the "Better Education = Healthier Lives" campaign focusing on the health of our communities, part of the NewPublicHealth National Prevention Strategy (Robert Wood Johnson Foundation). http://www.rwjf.org/en/blogs/new-public-health/2012/08/better_educationhea.html

most often "backward looking." Seldom do these plans have real metrics for success to measure progress toward specific objectives, or clear strategies for how to achieve those objectives. In turn, the objectives should "roll up" to align approximately with the overarching regional goals established by the individual community during discussions with the MPO or RPO and other communities nearby. NCDOT is in charge of most (75%) of the transportation system, with small towns and unincorporated areas playing at best a minor role in transportation decision-making. In addition, the expectations by the public, local agencies

and NCDOT on transportation and land use differs greatly adding challenges to a coordinated planning process. The funding structure for projects is based on outdated models that are not well adapted to current transportation and land use challenges.

NCDOT Complete Streets Design Guidelines

From a land use perspective, the report focuses on context-based approach as a means to integrate adjacent land use to the functionality of street design. Understanding that not one-size-fits-all employing the context-based approach allow the flexibility in the design of complete street to suit the diverse broad land use categories – urban, suburban, and rural - within North Carolina since of these land use categories has its own characteristics and function. This is a good starting point for addressing the integration of land use and transportation.

NCDOT's Traditional Neighborhood Development (TND) Street Design Guidelines

These guidelines are available for proposed TND developments and permits localities and developers to design certain roadways according to TND guidelines rather than the conventional subdivision street standards. The guidelines recognize that in TND developments, mixed uses are encouraged and pedestrians and bicyclists are accommodated on multi-mode/shared streets. This is a good first step for TND developments, but the concept should be expanded to apply to a broader range of applications and settings.

Policy Direction

Adopt a Multi-Modal Transportation Efficient Land Use Policy and Direction

Though not a new concept, NCDOT and its stakeholders need this policy to guide and educate their staff to eliminate inconsistencies during the planning, design and

implementation of the plan. It should also require local communities to develop smart growth codes. In turn, local communities should receive funding grants for land use and small area plans with additional assistance for adoption of codes and active participation in multi-modal transportation efficient land use.

Recommendations

To ensure the discussion of land use and transportation planning are interdependent during all local and regional planning efforts, a significant investment in time and capital resources will be needed to shift the current culture of transportation planning processes. The following are recommendations that could enhance better integration of these two mutually exclusive planning items.

A. Adoption of Land Use in Transportation Planning

1. Evaluate current NCDOT, MPO and RPO transportation planning policy to ensure that land use is considered in concert with transportation.
2. Develop policy to assess land use, connectivity, health, wellness, sustainability impacts into NCDOT project scoping decisions about building new roads or widening/reconstructing existing roads.
 - Develop metrics that address the above-mentioned topics that go beyond assessing congestion impacts.
 - Look beyond a curb-to-curb analysis to address local impacts (e.g. back of property to back of property).
 - Involve local land use planners, health agencies, and DBPT in the scoping process.
3. Implement a sign-off or review process from

- local land use planners on each state project in their jurisdiction. (NCDOT; NCBOT; NC State Legislature; Local governments).
4. Establish a venue for local land use planners to provide input into statewide transportation decisions.
- B. Develop a Guidebook for Land Use and Transportation. Similar to VDOT, NCDOT should take the lead, with other state agencies (through the Healthy Environments Collaborative), to conduct a planning effort that involves stakeholders from around the State to develop
- a guidebook, process, and policy moving forward to incorporate land use and transportation.
- C. Encourage partnerships between local land use planners, MPOs, and NCDOT to encourage understanding of land use goals such as smart growth and transportation strategies.
 - D. Develop Tools for Municipalities, Counties, and NCDOT
 1. Incorporate context- and transect-based approach for urban, suburban, and rural areas.
 2. Establish form-based codes (tool to regulate

Case Study: Transportation Efficient Land Use and Design – A Guide for Local Governments

The focus of the Virginia Department of Transportation report, *Transportation Efficient Land Use and Design – A Guide for Local Governments*, is to enhance the existing toolkit by adding tested, successful strategies that better integrate land use and transportation in more cost effective and efficient ways. The report provides guidance to achieve a strong and prescriptive integration of land use and transportation.

Transportation-efficient land use planning and design focuses on the principles of Traditional Neighborhood Development (TND) as a design approach that combines a range of community design elements to create a more attractive, efficient, and livable communities. TND is a human-scale, compact, and walkable development patterns, mixing of land uses, interconnected networks of streets and blocks, recognizable neighborhood centers and accessible open spaces. Though TND is not a one-size-fits-all approach to development, its guiding principles and design elements can be applied to all types of communities –urban, suburban, and rural – although with different scales and architectural styles.

The plan also addresses what to avoid (elements that are incompatible with TND) and are more geared toward conventional suburban and auto-oriented development. These include cul-de-sacs, separation of uses, lack of connected street grid, excessive curb cuts, high-speed vehicular travel, and absence of sidewalks or gaps in the sidewalk network.

Small area plans are also identified as another means identified to incorporate transportation efficiency since these plans examine key land use and transportation issues at a greater detail than a comprehensive plan. For example, pedestrian shed can be effectively analyzed. A community is considered walkable when it has a ¼-mile to ½-mile radius pedestrian shed which may be expanded if a neighborhood is served by transit and adjusted to account for topography and any barriers to pedestrian circulation.



Source: VDOT 'Transportation Efficient Land Use and Design' report. ▲

Case Study (Continued): Transportation Efficient Land Use and Design:
Transect-Based Approach for Urban, Suburban, and Rural Areas



◀ Proposed Future Land-Use Categories in the VDOT 'Transportation Efficient Land Use and Design' report, prepared by: The Cox Company, Renaissance Planning Group, and Rhodeside & Harwell.



development to achieve a specific urban form, in this case, a compact walkable development)

3. Adopt the principles of Traditional Neighborhood Development (These principles include compact development, mix of use, diverse housing options, transportation choices and environmental stewardship)
4. Develop small area plans for addressing local walkability/bikability.
5. Create graphic-based urban design guidelines and zoning regulations.

E. Consistent Terminology and Definition: Ensure consistency in the understanding of the terminology and definitions for land use and transportation by all

stakeholders. For instance the character of boulevards may have many versions among stakeholders resulting in challenges in design and implementation (NCDOT).

- F. Staff Support: Provide on-going support to surrounding communities during planning, design and implementation of the multi-modal transportation efficient land use plans in addition to just the current support arrangement. This ensures the plan can be enforced especially in rural areas where local staff and resources are not available (NCDOT). The new transportation planner assigned to each NCDOT division, or someone with land use expertise (preferred) should take on the responsibility to educate and support municipalities and counties.

- G. Disincentives: Incorporate a sprawl fee to local communities that do not have a working multi-modal transportation efficient land use plan. This recommendation could require NC General Assembly approval and how this is applied would require negotiations from all parties concerned (NCDOT; NCBOT; NC State legislature).
- H. Incentives: Provide incentives to local communities that develop land use and corridor plans with adopted codes that support multi-modal transportation efficient land use (NCDOT; NCBOT; NC State legislature).
- I. Education: More emphasis should be given to multi-modal transportation efficient land use discussions at all levels at NCDOT, regional entities, and local communities since each partner has a different understanding of this term. A common understanding can assist in addressing issues during planning, design and funding (NCDOT; ITRE).
- J. Modify Traffic Impact Studies to include multimodal component, including off-site improvements from major new developments to high pedestrian/bicycling attractors within $\frac{1}{4}$ mile of site (NCDOT).

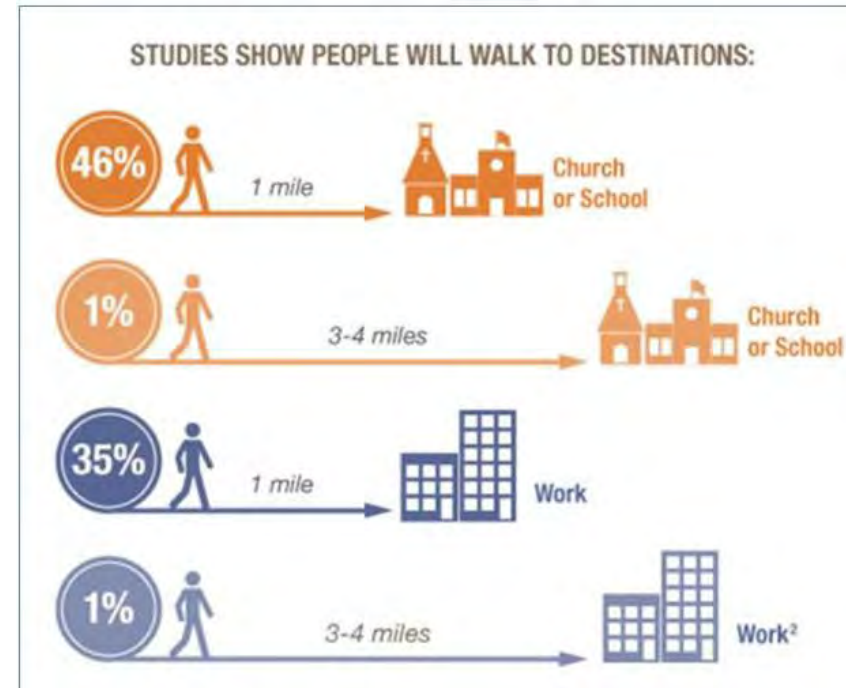
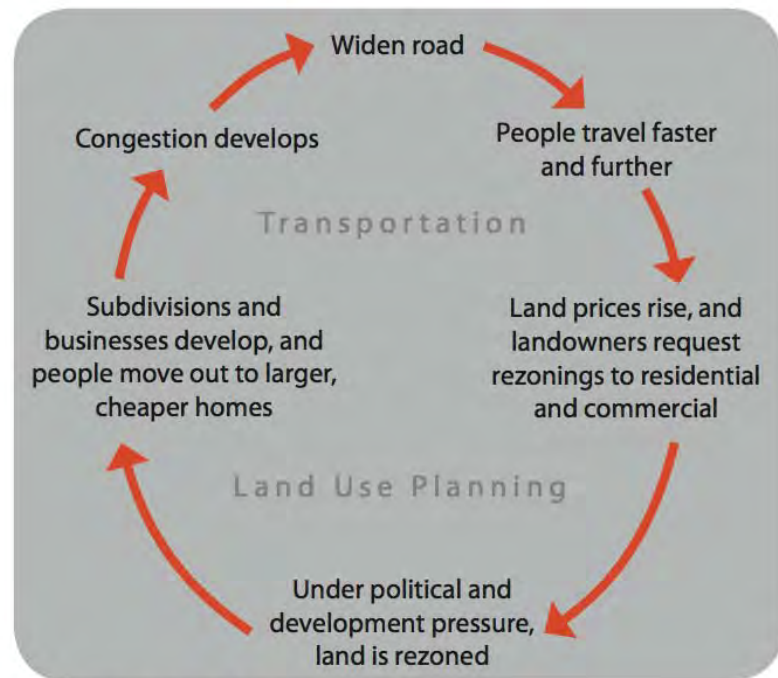


Image from the "Better Education = Healthier Lives" campaign focusing on the health of our communities, part of the NewPublicHealth National Prevention Strategy (Robert Wood Johnson Foundation). http://www.rwjf.org/en/blogs/new-public-health/2012/08/better_educationhea.html

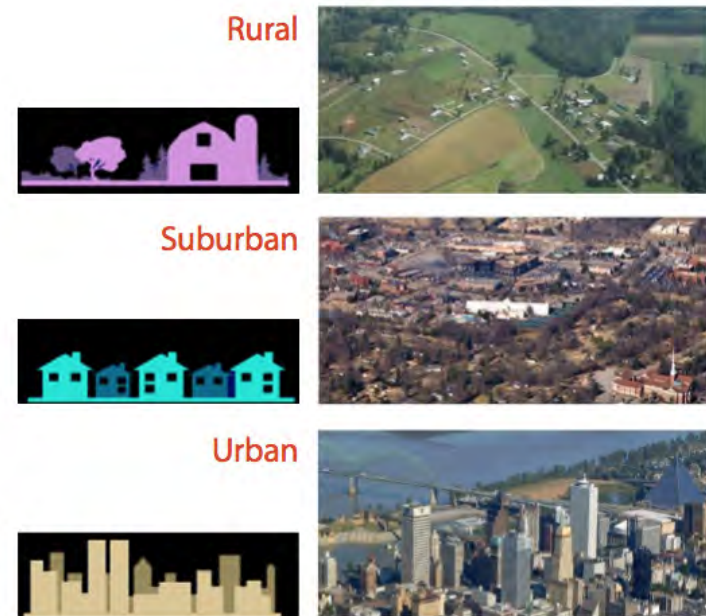
Case Study: Transportation Planning Alternatives for Tennessee:
 Removing Barriers to Smarter Transportation Investments (2012)

The Tennessee Department of Transportation (TDOT) and Smart Growth America partnered to find ways in which TDOT can more effectively use its limited resources to create better outcomes. The working team executed a thorough, but fast-paced process that engaged Department staff and community stakeholders from across the state to help formulate a path to removing barriers to better investment. Among the major findings is a call to action regarding transportation and land-use:

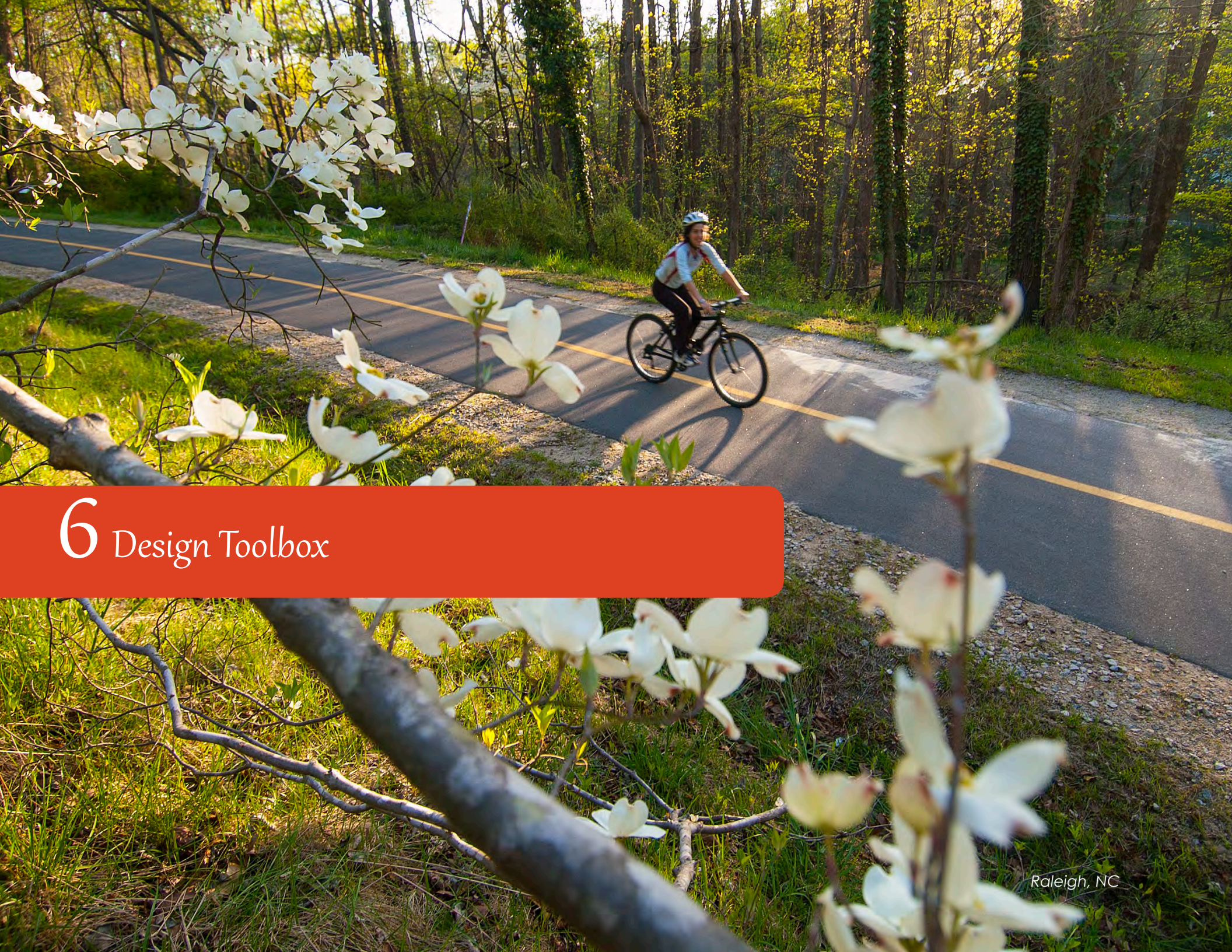
"TDOT should develop joint transportation/land use corridor studies that improve projects and identify beneficiaries who can bring more project dollars to the table. While local governments are solely responsible for local land use planning, it is important for TDOT to coordinate state transportation plans and projects with local land use planning agencies. This will more effectively leverage the taxpayers' investments."



Transportation and Land Use Cycle



Tennessee's diverse development patterns require that TDOT utilize tools and process that enable the development of tailored context sensitive transportation solutions.



6 Design Toolbox

OVERVIEW

As described in the Design Guidance section of Chapter 5, NCDOT should update its Roadway Design Manual to include prescriptive pedestrian and bicycle design treatments and develop new Bicycle and Pedestrian Facility Design Guidelines. Existing guidance, including the new Complete Streets Guidelines, are generally high-level discussions of pedestrian and bicycle design strategies. More detail is needed for designers to clearly understand how to implement these strategies.

This chapter serves as a Toolbox to identify key elements currently missing from NCDOT guidebooks. This Toolbox will be a robust resource that helps planners and designers select appropriate facilities or treatments given the project context and the issues being addressed. FHWA's PEDSAFE and BIKESAFE toolboxes are examples of best practices for this type of resource. NCDOT's Pedestrian and Bicycle Facility Toolbox will take the best information and resources that are available nationally, and apply them to the North Carolina context.

In order to be a useful resource, the Toolbox needs to facilitate a more complex planning and design decision process. The Toolbox should emphasize that it is not always desirable or possible to just apply basic standards - factors including nearby land uses, variations in traffic speed and volumes, existing as well as projected future demand will influence the design of any given facility. The Toolbox will highlight these issues and provide an understanding of trade-offs in pedestrian and bicycle facility design.

This Toolbox of resources and treatments, intended to provide guidance for Roadway Design Manual updates, will not be a static document. The field of pedestrian and bicycle facility design is rapidly evolving, and the NCDOT design manuals should be regularly updated to reflect the latest proven designs and treatments. By providing a detailed and current Pedestrian and Bicycle Facility Toolbox, NCDOT can offer designers and planners a comprehensive resource for developing and implementing pedestrian and bicycle accommodations and improvements. Incorporation of this Toolbox into the RDM will ensure that it is used to guide design decisions on a project by project basis.

In this Chapter

Overview

National Pedestrian Facility Design Resources

National Bicycle Facility Design Resources

Pedestrian and Bicycle Facilities in the NCDOT Complete Streets Planning and Design Guideline

Pedestrian Facilities not in the NCDOT Complete Streets Guide

Bicycle Facilities not in the NCDOT Complete Streets Guide

NCDOT Complete Streets Compliance with National and State Standards and Guidelines

Context and Design Considerations

Conclusion

NATIONAL PEDESTRIAN FACILITY DESIGN RESOURCES

Numerous national resources exist for the design and development of pedestrian facilities. These resources are briefly outlined below.

FHWA PEDSAFE Pedestrian Safety Guide and Countermeasure Selection System: This interactive website allows users to select the type of problem or crash issue they are attempting to address and provides guidance on pedestrian facility types that may be appropriate. The website includes detailed descriptions of many types of facilities, including the purpose of each facility, considerations when implementing the facility, estimated costs and case studies from around the nation.

<http://www.walkinginfo.org/pedsafe/>

Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way: Developed by the U.S. Access Board, the PROWAG provides draft accessibility guidelines for the design, construction and alteration of pedestrian facilities in the public right-of-way. The guidelines ensure that sidewalks, pedestrian street crossings, pedestrian signals and other facilities for pedestrian circulation and use constructed or altered in the public right-of-way by state and local governments are readily accessible to and usable by pedestrians with disabilities. Compliance with the accessibility guidelines will be mandatory when they are finalized and adopted.

<http://www.access-board.gov/prowac/nprm.htm>

How to Develop a Pedestrian Safety Action Plan: This document will help state and local officials know where to begin to address pedestrian safety issues. It is intended to assist agencies in further enhancing their existing pedestrian

safety programs and activities, including identifying safety problems, analyzing information and selecting optimal solutions. The guide also contains information on how to involve stakeholders, potential sources of funding for implementing projects and how to evaluate projects. The guide is primarily a reference for improving pedestrian safety through street redesign and the use of engineering countermeasures, as well as other safety-related treatments and programs that involve the whole community.

http://safety.fhwa.dot.gov/ped_bike/ped_focus/docs/fhwasa0512.pdf

AASHTO Guide for the Planning, Design and Operation of Pedestrian Facilities: The purpose of this guide is to provide guidance on the planning, design and operation of pedestrian facilities along streets and highways. The guide focuses on identifying effective measures for accommodating pedestrians on public rights-of-way. Appropriate methods for accommodating pedestrians, which vary among roadway and facility types, are described in this guide. The guide also acknowledges the effect that land use planning and site design have on pedestrian mobility and addresses these topics in detail.

https://bookstore.transportation.org/item_details.aspx?id=119

FHWA Designing Sidewalks and Trails for Access: The document is the Federal Highway Administration's two part report on pedestrian and trail accessibility. Part 1 of the Guide lays out the history and the practices of applying accessibility concepts to sidewalks and pedestrian trails while Part 2 provides recommendations on how to design sidewalks, street crossings, intersections, shared use paths and recreational pedestrian trails. Both parts of the Guide are out of print and are available online only. Since the



Guide was last published in 2001, accessibility guidelines and practices and construction and maintenance techniques have evolved, and more current information may be available.

http://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/sidewalks/

http://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/sidewalk2/

NATIONAL BICYCLE FACILITY DESIGN RESOURCES

Numerous national resources exist for the design and development of bicycle facilities. These resources are briefly outlined below.

AASHTO Guide for the Development of Bicycle Facilities, 4th Edition: Published by the American Association of State Highway and Transportation Officials, this guide provides information on how to accommodate bicycle travel and operations in most riding environments. The guide is intended to present sound planning and design guidelines by referencing a recommended range of design values and describing alternative design approaches. Some flexibility is permitted to encourage designs that are sensitive to local context and incorporate the needs of bicyclists, pedestrians, and motorists.

https://bookstore.transportation.org/item_details.aspx?id=1943

NACTO Urban Bikeway Design Guide: The National Association of City Transportation Officials produced this guide of “innovative” bicycle facilities based on the experience of the best cycling cities in the world. The designs in the guide were developed specifically for urban settings,

since unique urban streets require innovative solutions. Most of these treatments are not directly referenced in the current version of the AASHTO Guide, although they are virtually all permitted under the *Manual on Uniform Traffic Control Devices* (MUTCD). All of the NACTO *Urban Bikeway Design Guide* treatments are in use internationally and in many cities around the US.

<http://nacto.org/cities-for-cycling/design-guide/>

FHWA BIKESAFE Bicycle Countermeasure Selection System: This interactive website allows users to select the type of problem or crash issue they are attempting to address, and provides guidance on facility types that may be appropriate. BIKESAFE also includes a large number of case studies to illustrate treatments implemented in communities throughout the United States. The system allows the user to refine their selection of treatments on the basis of site characteristics, such as geometric features and operating conditions, and the type of safety problem or desired behavioral change. The purpose of the system is to provide the most applicable information for identifying safety and mobility needs and improving conditions for bicyclists within the public right-of-way.

<http://www.bicyclinginfo.org/bikesafe/>

Bicycle Road Safety Audit Guidelines and Prompt Lists: This FHWA guide provides information on how to conduct road safety audits and effectively assess the safety of bicyclists. The guidelines provide an overview of the Road Safety Audit process, as well as an overview of basic safety principles and potential hazards affecting cyclists. Prompt lists are provided to assist team members in considering general issues when performing a bicycle road safety audit.

http://safety.fhwa.dot.gov/ped_bike/tools_solve/fhwasa12018/fhwasa12018.pdf

Level of Service Indicators: Level of Service (LOS) refers to performance indicators that rate transportation system service quality from A (best) to F (worst). Level of Service has long been used for rating conditions for motor vehicle traffic, but relatively sophisticated LOS indicators now exist for bicycle and pedestrian conditions. Most important, the Multimodal LOS assesses conditions for multiple modes on a street including walking, bicycling, and public transportation. The Multimodal LOS elements have been integrated into the 2010 Highway Capacity Manual and can help agencies determine how design changes to a street or roadway impact users of different modes.

<http://www.trb.org/Main/Blurbs/164718.aspx>

<http://www.trb.org/Main/Blurbs/160228.aspx>

NCDOT COMPLETE STREETS COMPLIANCE WITH NATIONAL AND STATE STANDARDS AND GUIDELINES

FHWA Traffic Control Device/Marking Compliance Categories

The FHWA MUTCD is not a facilities manual, but rather identifies describes federally approved traffic control devices (markings, signs and signals). These devices may be in various stages of the FHWA approval process, these are identified below

SYMBOL	CATEGORY	DESCRIPTION
★★★★	Approved	The traffic control device is included or featured in the MUTCD and can be implemented at this time.
★★★	Compliant	The treatment may be implemented at this time, if MUTCD compliant signs and pavement markings are used.
★★	Interim Approval	Interim approval permits local application of new traffic control devices in accordance with prescribed guidance.
★	Included	The guidelines/standards discuss this topic and provide at least some guidance for application considerations.
☆	Experimental	The treatment may be installed with FHWA approval of a Request To Experiment (RTE), and has been done so by other jurisdictions.
○	N/A	This treatment is not considered a traffic control device and the MUTCD does not apply to this topic. Lack of inclusion should not be considered non compliance.

Facility Design Guidelines Compliance Categories

Facility design guidelines describe the application of various facilities to roadways.

SYMBOL	CATEGORY	DESCRIPTION
◆	Included	The guidelines/standards discuss this topic and provide at least some guidance for application considerations.
◇	Experimental	The guidelines/standards discuss this treatment, and generally discourage their use outside of very specific contexts.
○	N/A	The guidelines/standards are silent to this topic. Lack of discussion is not a statement of non-compliance.

Summary of Complete Streets Compliance with National and State Standards and Guidelines

	FHWA MARKING COMPLIANCE	FACILITY DESIGN GUIDELINES COMPLIANCE				
	FHWA MUTCD (2009)	AASHTO GUIDE FOR THE DEVELOPMENT OF BICYCLE FACILITIES (2012)	NACTO URBAN BIKEWAY DESIGN GUIDE (2012)	ITE DESIGNING WALKABLE URBAN THOROUGHFARES: A CONTEXT SENSITIVE APPROACH (2010)	NORTH CAROLINA BICYCLE FACILITIES PLANNING AND DESIGN GUIDELINES (1994)	NORTH CAROLINA DEPARTMENT OF TRANSPORTATION COMPLETE STREETS PLANNING AND DESIGN GUIDELINES (2012)
Bicycle Focused Treatments						
Shared Roadway Facilities						
Unmarked Wide Outside Lane	★★★	◆	○	○	◆	○
Signed Bike Route	★★★★	◆	○	○	◆	◆
Shared Lane Markings	★★★★	◆	◆	○	○	◆
Bicycle Boulevard	★★★★*	◆	◆	○	○	○
"Home Zone"	★★★*	○	○	○	○	○
On-Street Facilities						
Shoulder Bikeway	★★★★	◆	○	○	◆	◆
Conventional Bike Lanes	★★★★	◆	◆	◆	◆	◆
Buffered Bike Lanes	★★★★	◆	◆	○	○	○
Contra-Flow Bike Lanes	★★★★	○	◆	○	○	○
Left-Side Bike Lanes	★★★★	◆	◆	○	○	○
Advisory Bike Lane	☆	○	○	○	○	○
Uphill Bicycle Climbing Lane	★★★	◆	◆	○	◆	○
Cycle Track Bikeways						
One-Way Protected Cycle Tracks	○	◆*	◆	○	○	○
Raised Cycle Tracks (aka Raised Bike Lanes)	○	○	◆	○	○	○
Two-Way Cycle Tracks	○	◇*	◆	○	○	○
Cycle Track Mixing Zone	★★★	○	◆	○	○	○

	FHWA MARKING COMPLIANCE	FACILITY DESIGN GUIDELINES COMPLIANCE				
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[add note about FHWA considerations to clarify what N/A means]		* The 2012 AASHTO Guide to the Design of Bicycle Facilities does not mention "cycle tracks" by name. The provided guidance discourages two-way operation of bicycles on one side of the street, such as on a two-way cycle track, but does acknowledge that "it may be better to place one-way sidepaths on both sides of the street.." p5-11				
Off-Street Bikeways						
Multi-Use Path	★★★★★	◆	○	○	◆	◆
"Sidepath"	★★★★	◇	○	○	◇	◆
Bikeway Intersection Treatments						
Advance Stop Line for adjacent motor vehicle lane	★★★★★	○	○	○	○	○
Bike Boxes	☆	○	◆	◆	○	◆
Two-Stage Turn Queue Boxes	★★★	○	◆	○	○	○
Median Refuge Island for Bicycle Use	★★★★	◆	◆	◆	○	○
Through Bike Lanes at Auxiliary Right Turn Only Lanes (aka "add lanes")	★★★★★	◆	◆	◆	◆	◆
Combined Bike Lane/Turn Lane	★★★★*	○	◆	○	○	○
Intersection Crossing Markings						
Intersection Crossing Markings (Dotted line extensions at a minimum)	★★★★*	◆	◆	◆	◆	○
Crossing Markings: Color, bicycle symbols	★★					

	FHWA MARKING COMPLIANCE	FACILITY DESIGN GUIDELINES COMPLIANCE				
	FHWA MUTCD (2009)	AASHTO GUIDE FOR THE DEVELOPMENT OF BICYCLE FACILITIES (2012)	NACTO URBAN BIKEWAY DESIGN GUIDE (2012)	ITE DESIGNING WALKABLE URBAN THOROUGHFARES: A CONTEXT SENSITIVE APPROACH (2010)	NORTH CAROLINA BICYCLE FACILITIES PLANNING AND DESIGN GUIDELINES (1994)	NORTH CAROLINA DEPARTMENT OF TRANSPORTATION COMPLETE STREETS PLANNING AND DESIGN GUIDELINES (2012)
Crossing Markings: Elephants Feet	○					
On-Street Bikeway Intersection Crossings						
Bicycle Signal Heads	☆	○**	◆	○	○	○
Signal Detection and Actuation	★★★★	◆	◆	◆	◆	◆
Active Warning Beacon for Bike Route crossing at Unsignalized Intersection	☆	○	◆	○	○	○
Rectangular Rapid Flash Beacon	★★*	○	◆	○	○	○
Hybrid Beacon for Bike Route Crossing of Major Street	★★★★***	○	◆	○	○	○
<p>*[use of W11-15 (bike/ped) sign is not addressed in the IA for RRBs]</p> <p>** The 2012 AASHTO Guide to the Design of Bicycle Facilities refers to the application of conventional traffic signals for bicycle-only use.</p> <p>*** when used with bicycle signal head, experimentation required</p>						
Off-Street Bikeway Midblock Crossings						
Hybrid Beacon for Off-Street Path Crossing	★★★★	◆	◆	○	○	○
Active Warning Beacon	★★★★	◆	◆	○	○	○
Rectangular Rapid Flash Beacon	★★	○	◆	○	○	○
Bicycle Signal Head	☆	○**	○	○	○	○
Additional Marking and Signing						
Bike Route Wayfinding Signage	★★★★*	◆	◆	○	◆	◆
Colored Bike Facilities	★★	◆	◆	◆	○	○

	FHWA MARKING COMPLIANCE	FACILITY DESIGN GUIDELINES COMPLIANCE		
	FHWA MUTCD (2009)	AASHTO GUIDE FOR THE PLANNING, DESIGN, AND OPERATION OF PEDESTRIAN FACILITIES (2004)	ITE DESIGNING WALKABLE URBAN THOROUGHFARES: A CONTEXT SENSITIVE APPROACH (2010)	NORTH CAROLINA DEPARTMENT OF TRANSPORTATION COMPLETE STREETS PLANNING AND DESIGN GUIDELINES (2012)
Pedestrian Focused Treatments				
Pedestrian Ways				
Buffered sidewalks	○	◆	◆	◆
Pedestrian Scale Lighting	○	◆	◆	◆
Street trees	○	◆	◆	◆
ADA Curb Ramps	★★★★	◆	◆	◆
Shoulders for Pedestrian Travel	★★★★	◆	○	◆
Multi-Use Paths	★★★★	◆	○	◆
"Sidepaths"	★★★★	◆	○	◆
Un-signalized Crossings				
Midblock Crossings	★★★★	◆	◆	◆
Marked crosswalks	★★★★	◆	◆	◆
Pedestrian Crossing Advanced Warning Signs	★★★★	◆	◆	◆
Pedestrian bridges: overpasses and underpasses	○	◆	○	◆
In-street pedestrian crossing sign	★★★★	◆	○	○
Advance yield/stop lines at crossings	★★★★	◆	◆	○
Raised Crosswalk	★★★★	◆	◆	◆
Refuge Island	★★★★	◆	◆	◆
Two-stage Pedestrian Crossing	★★★★	◆	◆	◆
High visibility crosswalks	★★★★	◆	◆	◆



	FHWA MARKING COMPLIANCE	FACILITY DESIGN GUIDELINES COMPLIANCE		
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Crossing Beacons for use at midblock or unsignalized crosswalks				
Pedestrian hybrid beacon	★★★★	○	○	◆
Conventional Continuous Flashing Warning Beacon	★★★★	◆	◆	○
Active Warning Beacons	★★★★	○	◆	◆
Rectangular Rapid Flash Beacon	★★	○	○	◆
Signalized Intersections				
Pedestrian Countdown Signal Head	★★★★	◆	◆	◆
Pedestrian pushbutton actuators	★★★★	◆	◆	○
"No turn on red" sign	★★★★	◆	◆	○
Leading pedestrian interval	★★★★*	◆	○	○
General Roadway Design				
Median island	★★★★	◆	◆	◆
Curb Extension	○	◆	◆	◆
Curb radius reductions	○	◆	◆	◆
Sight distance considerations	○	◆	◆	◆
Narrow (10') Travel Lanes	○	○	◆	◆
Road Diet Conversions	○	○	◆	◆
Single-Lane Roundabouts	★★★★	◆	◆	◆
Multi-lane roundabouts	★★★★	◆	◆	◆
Access Management				
Pedestrian-Friendly Driveways	○	◆	◆	○
Consolidate driveways	○	◆	◆	○

Right-in, right-out Channelization	○	◆	○	○
Transit Stop Considerations				
Best practice for transit stop placement	○	○	◆	◆
Concrete pads	○	◆	◆	◆
Benches and shelters	○	◆	◆	◆
Lighting	○	○	◆	◆
Other				
Low Impact Development/ Green Infrastructure	○	○	◆	◆
Pedestrian Wayfinding Signage	○	○	○	○
Block Length	○	○	◆	◆
Traffic Calming				
Mini traffic circles	★★★★	◆	○	○
Chicanes	○	◆	○	○
Speed humps/tables	★★★★	◆	◆	○
Queueing Streets	○	◆	○	○
Woonerf	★★★*	◆	○	○

PEDESTRIAN AND BICYCLE FACILITIES IN THE NCDOT COMPLETE STREETS PLANNING AND DESIGN GUIDELINES

NCDOT adopted a Complete Streets policy in July 2009. The policy directs the North Carolina Department of Transportation (NCDOT) to consider and incorporate all modes of transportation when building new projects or making improvements to existing infrastructure. In June 2012, NCDOT published the *Complete Streets Planning and Design Guidelines* to provide guidance on how to implement the 2009 Complete Streets policy. The Guidelines include a number of pedestrian facilities and treatments that are detailed below.

Pedestrian Facilities and Treatments

Sidewalks: Sidewalks are the primary mode of pedestrian travel in most non-rural areas and are a crucial element in any pedestrian network. Sidewalks should be part of a continuous network, connected with crosswalks and separated from traffic with a buffer (see next treatment).



Sidewalk Buffer Zones: A buffer is a strip of land that separates vehicular traffic from the sidewalk or other pedestrian facility. A buffer zone of four to six feet is desirable, and will vary with the street type and surrounding land uses.



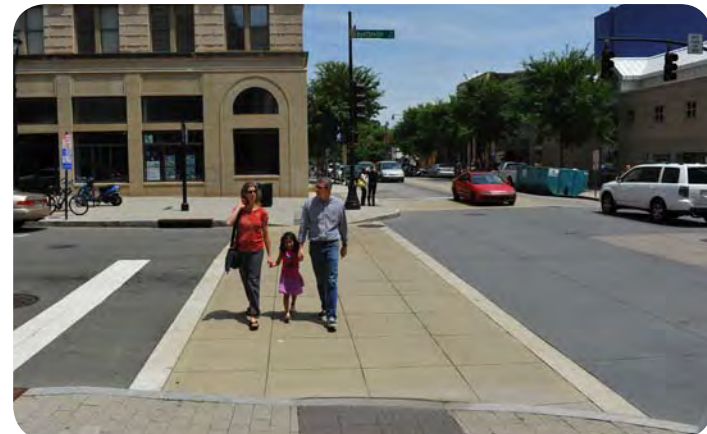
Multi-use Paths: A multi-use path separates pedestrian and bicycle traffic from vehicular traffic on streets with less frequent access or higher speeds, such as parkways or some rural roads. Multi-use paths are popular with recreational walkers or runners and commuters and in places where destinations are spaced further apart.



Pedestrian Lighting: Lighting should be provided near transit stops, commercial areas, or other locations where night-time pedestrian activity is likely. Pedestrian-scale lighting such as street lamps helps to illuminate a sidewalk, and improves pedestrian safety and security.



Pedestrian Crossings: Pedestrian crossings and/or crosswalks are another crucial element in any pedestrian network. Crossing treatments vary depending on a number of factors, including nearby land uses, transit stop locations, and characteristics of the street.



Curb Extensions: Curb extensions (also called nubs, bulb-outs or bump-outs) are extensions of sidewalks that narrow the street, increase pedestrian visibility, and decrease pedestrian crossing distance. They are also an element of traffic calming that prioritizes pedestrian safety, can reduce vehicle speeds, and can serve to protect on-street parking.



Paved Shoulders: In rural areas, shoulders may be the only pedestrian facility. Wide shoulders on rural roads allow pedestrians to travel along a gravel and sometimes paved surface in a separate space from traffic. Paved shoulders are much preferred and offer numerous benefits to all users of the roadway including bicyclists.



Bicycle Facilities and Treatments

Signed Bike Route: Signed bike routes help bicyclists to navigate lower-volume street networks. Bicycle signage is an important element of bike routes that alerts motorists to the presence of bicycle traffic while providing information to bicyclists.



Shared-Lane Markings: Shared lane markings provide an alternative to bicycle lanes on streets where bicycle lanes cannot be accommodated. Shared-lane markings (also known as “sharrows”) indicate a shared-use lane for motorists and cyclists.



Paved Shoulders: In many rural areas, four foot wide paved shoulders are the typical treatment for accommodating bicyclists. Four foot wide paved shoulders allow bicyclists to travel on a paved surface adjacent to through traffic, if desired. Where speeds are 55 mph and above, five foot wide or wider paved shoulders are preferred.



Bicycle Lanes: Dedicated bicycle lanes are the preferred option to provide for the greatest variety of cyclists on streets, particularly those streets with higher volumes and



speeds. Bicycle lanes are the backbone of a complete bicycle network, as they visually distinguish a bicycle-only travel lane in which a cyclist does not have to maneuver around motor vehicles and vice versa.

Multi-Use Paths: On streets where physical separation of bicycle traffic from motoring traffic is appropriate (such as on very low-access, high-speed facilities like parkways and potentially some rural roads), multi-use paths should be considered. Multi-use paths are paved pathways that accommodate both cyclists and pedestrians.



Sidepath: Sidepaths are multi-use paths that are located exclusively adjacent to a roadway, typically within the road right of way. These provide bicycle and pedestrian connections where on-road bicycle facilities and/or sidewalks are not feasible due to traffic volumes, speeds or road width.



Bike Box: A bike box is a designated area at the head of a traffic lane at a signalized intersection that provides bicyclists with a safe and visible way to get ahead of



queuing traffic during the red signal phase. Bike boxes are typically applied at signalized intersections with high volumes of bicycles and/or motor vehicles, especially those with frequent bicyclist left-turns and/or motorist right-turns. (NACTO)

Right Turn Through Bike Lane: Right-turn-only lanes are often used where right-turning motor vehicle volumes warrant an exclusive right-turn lane to improve traffic flow. The correct placement of a bike lane is on the left of an exclusive right-turn lane. Incorporating the bike lane to the left of the right-turn-only lane enables bicyclists and right turning motorists to sort their paths by destination in advance of the intersection, avoiding last moment conflicts. (AASHTO)



Signal Detection and Actuation: Bicycle detection at traffic signals is used at actuated signals to alert the signal controller of bicycle crossing demand on a particular approach. Bicycle detection occurs either through the use of push-buttons or by automated means (e.g., in-pavement loops, video, microwave, etc). (NACTO)



Bike Route Wayfinding Signage: Bicycle signage alerts motorists to the presence of bicycle traffic while providing information to bicyclists. Both bicycle lanes and



shared lane markings should include signage, but bicycle signage that identifies a designated bicycle route can be a standalone element. Offering additional wayfinding information with bike route signs as appropriate can enhance quality of service.

Transit Facilities and Treatments

Transit Stop Benches and Shelters: Bus shelters provide a place protected from the elements for transit users to wait for a transit vehicle. Bus shelters should include seating, lighting, and bus information. In places where there is not enough demand or usage to justify a complete bus shelter, seating alone can improve the experience of waiting for a bus. Seating typically includes one or more benches near a bus stop.



Transit Stop Lighting: Lighting enhances the visibility and safety of a transit stop. Lighting also improves the readability of transit features such as schedules.



Transit Signage: Signage helps transit users locate the bus stop. Signage can identify the route serving a stop and provide any additional information on the route and schedule.



PEDESTRIAN FACILITIES NOT IN THE NCDOT COMPLETE STREETS GUIDE

Numerous pedestrian facilities and treatments exist in addition to the pedestrian facilities cited in the Complete Streets Guidance. These facilities and treatments are briefly described below and should be included in the updated Pedestrian and Bicycle Facilities Toolbox. The facilities and treatments are divided into categories, but may be appropriate to use in settings other than the category they are included within.

Un-signalized Intersections

Advanced Pedestrian Warning Signs: Advanced warning signs warn motorists to be aware of pedestrians in the area. Advance pedestrian warning signs should be used where pedestrian crossings may not be expected by motorists, especially if there are many motorists who are unfamiliar with the area.



Marked Crosswalks: Marked crosswalks serve to emphasize the right-of-way where motorists can expect pedestrians to cross and designate a stopping or yielding location. They can also indicate optimal or preferred locations for pedestrians to cross. Marked crosswalks should often be installed in conjunction with other enhancements that physically reinforce crosswalks and reduce vehicle speeds, particularly at uncontrolled locations and on more major roads.



Pedestrian Overpasses and Underpasses: Pedestrian overpasses and underpasses allow pedestrians to cross streets without any conflicts with vehicles on the street. It is important to recognize and document conditions that warrant these facilities as they are not appropriate in all locations.



Mini Traffic Circles: Mini traffic circles are raised circular islands constructed in the center of residential street intersections (generally intended for use where streets are



functionally classified as local or neighborhood streets). They reduce vehicle speeds by forcing motorists to maneuver around them.

In-Street Pedestrian Crossing Signs: In-street pedestrian crossing signs reinforce the presence of crosswalks and remind motorists of their legal obligation to yield for pedestrians in marked or unmarked crosswalks. This signage is often placed at high-volume pedestrian crossings that are not signalized.



Advanced Yield/Stop Lines at Crossings: At signalized intersections and midblock crossings, the vehicle stop line can be moved farther back from the pedestrian crosswalk for an improved factor of safety and for improved visibility of pedestrians. Advanced stop lines allow pedestrians and drivers to have a clearer view of each other and more time in which to assess each other's intentions. Advanced stop lines are also applicable for non-signalized crosswalks on

multi-lane roads to ensure that drivers in all lanes have a clear view of a crossing pedestrian.



Rectangular Rapid Flashing Beacons: The RRFB is a rectangular shaped lightbar with two high intensity LED lightheads that flash in a wig-wag flickering pattern. The lights are installed below the pedestrian crossing sign (located on each side of the road near the crosswalk button) and are activated when a pedestrian pushes the crosswalk button. The lights flash for a set time while the pedestrian crosses the street. At all other times the lights are dark.



Right-in, Right-out Channelization: Right-in, right-out refers to access management for streets or driveways where the only movements allowed are right turns. Right-in, right-out designs can improve conditions for pedestrians by reducing the number of potential conflicts between motor vehicles and pedestrians. Because vehicles will only be coming from one direction, it is easier for pedestrians to watch for approaching vehicles and to be sure that the vehicle operator sees them before proceeding.



Signalized Intersections

Pedestrian Signal Head: Pedestrian signal heads indicate to pedestrians when they should cross a street. Pedestrian signal indications should be used at traffic signals wherever warranted, according to the MUTCD. The use of WALK/DON'T WALK pedestrian signal indications at signal locations are important in many cases, including when vehicle signals are not visible to pedestrians, when signal timing is complex (e.g., there is a dedicated left-turn signal for motorists), at established school zone crossings, when an exclusive pedestrian interval is provided, and for wide streets where pedestrian clearance information is considered helpful. Countdown signals that indicate the amount of time pedestrians have remaining to cross the street should be installed with all new or replacement signals.

Signalization may also be audible to those who are sight-impaired.



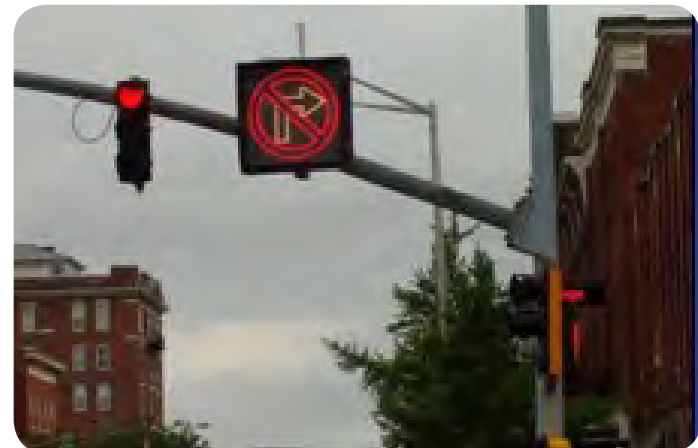
Pedestrian Pushbutton Actuators and Pedestrian Detection Systems: In locations where pedestrian signals are not automatically actuated during each signal cycle, pushbutton actuators should be provided to allow pedestrians to “call” the signal. However, since pedestrian pushbutton devices are not activated by about one-half of pedestrians, automated pedestrian sensors that detect the presence of pedestrians and trigger the pedestrian signal should also be considered. Manual pedestrian signal actuators should only be installed where pedestrian traffic is expected to be low to intermittent.



Right Turn on Red Restrictions: Prohibiting RTOR should be considered where and/or when there are high pedestrian volumes. This can be done with a simple sign posting, although there are some options that are more effective than a standard sign. For areas where a right-turn-on-red restriction is needed during certain times, time-of-day restrictions may be appropriate.



Leading Pedestrian Interval (LPI): A LPI gives pedestrians an advance walk signal before the motorists



traveling adjacent to them get a green light, giving the pedestrian several seconds to start in the crosswalk where there is a concurrent signal. This makes pedestrians more visible to turning motorists and makes motorists more likely to yield to them. This advance crossing phase approach has been used successfully in several U.S. cities for decades and studies have demonstrated reduced conflicts for pedestrians.

Midblock Crossings

Pedestrian Hybrid Beacon: Installed at mid-block crosswalks, the Pedestrian Hybrid Beacons (PHB), formerly known as the HAWK, remains dark until a pedestrian presses a pushbutton to activate the system. When activated, the system flashes a sequence of amber warning beacons followed by red “stop” beacons, providing motorists with the message to stop. PHB systems include count-down pedestrian signal heads that indicate to pedestrians when they should cross.



Raised Crosswalk: Raised crosswalks are essentially speed tables with a crosswalk across them. Raised crosswalks slow traffic on the street, and can provide a more accessible crossing for disabled pedestrians depending on how the crosswalk connects to the sidewalk.



Refuge Island: Crossing islands – also known as center islands, refuge islands, pedestrian islands, or median slow points – are raised islands placed in the center of the street at intersections or midblock to help protect crossing



pedestrians from motor vehicles. Center crossing islands allow pedestrians to deal with only one direction of traffic at a time, and they enable them to stop partway across the street and wait for an adequate gap in traffic before crossing the second half of the street.

Two-Stage Crossing: Two-stage crossings utilize a refuge island to allow pedestrians to cross a street in two stages. The refuge islands may be medians islands between opposing directions of traffic or “pork chop” islands between turning and through lanes. By providing an island, pedestrians who cannot make the crossing in a single signal cycle can wait for the next signal to complete their crossing.



Pedestrian Paths / Sidewalks General

Street Trees: Street trees are planted in the buffer area between the street and the sidewalk. Street trees provide a number of benefits including providing a physical barrier between pedestrians and the street, providing shade, visually narrowing the street which may slow traffic, and improved aesthetics. Care must be used when selecting

street tree varieties to ensure they can survive in the buffer area and not damage surrounding sidewalks or streets.



Curb Ramps: Curb ramps provide access between the sidewalk and roadway for people using wheelchairs, strollers, walkers, crutches, handcarts, bicycles, and also for pedestrians with mobility impairments who have trouble stepping up and down high curbs. Curb ramps must be installed at all intersections and midblock locations where pedestrian crossings exist, as mandated by federal



Consolidate Driveways: Driveway crossings of sidewalks often create hazards for pedestrians as motorists may not be looking for pedestrians as they pull into or out of a driveway. Where multiple driveways exist in close proximity, efforts should be made to consolidate the driveways and reduce conflict points with pedestrians.

Driveway Treatments: Several driveway designs may cause safety and access problems for pedestrians, including excessively wide and/or sloped driveways, driveways with large turning radii, multiple adjacent driveways, driveways that are not well defined, and driveways where motorist attention is focused on finding a gap in congested traffic. Examples of driveway improvements include narrowing or closing driveways, tightening turning radii, converting driveways to right-in only or right-out only movements, and providing median dividers on wide driveways.



Roadway Design

Median or Crossing Islands: Crossing islands—also known as center islands, refuge islands, pedestrian islands, or median slow points—are raised islands placed in the center of the street at intersections or midblock to help protect crossing pedestrians from motor vehicles. Center crossing islands allow pedestrians to deal with only one direction of traffic at a time, and they enable them to stop partway across the street and wait for an adequate gap in traffic before crossing the second half of the street. They are a proven crash reduction device for pedestrians. Some of them can be designed so they are staggered or angled across a median causing pedestrians to face traffic as they are approaching the crossing from the median to street side. At signalized intersections, median islands provide a waiting place for pedestrians who may not be able to cross the full intersection during one signal cycle.

Chicanes: Chicanes are used to slow traffic. Chicanes create a horizontal diversion of traffic and can be gentler or more restrictive depending on the design. Shifting a travel lane has an effect on speeds as long as the taper is not so gradual that motorists can maintain speeds. For traffic calming, the taper lengths may be as much as half of what is suggested in traditional highway engineering.



Speed humps/tables: Speed humps and tables are raised sections of the roadway used to slow motor vehicle traffic. Speed humps are paved (usually asphalt) and



approximately 75 to 100 mm (3 to 4 in) high at their center, and extend the full width of the street with height tapering near the drain gutter to allow unimpeded bicycle travel. A “speed table” is a term used to describe a very long and broad speed hump, or a flat-topped speed hump, where sometimes a pedestrian crossing is provided in the flat portion of the speed table.

Road Diet for decreased crossing distance:

Roadway narrowing can improve conditions and safety for pedestrians by decreasing vehicle speeds and the distance pedestrians have to travel to cross the street. Roadway narrowing can be achieved by narrowing vehicle lanes, removing travel lanes, adding on-street parking, or other means.

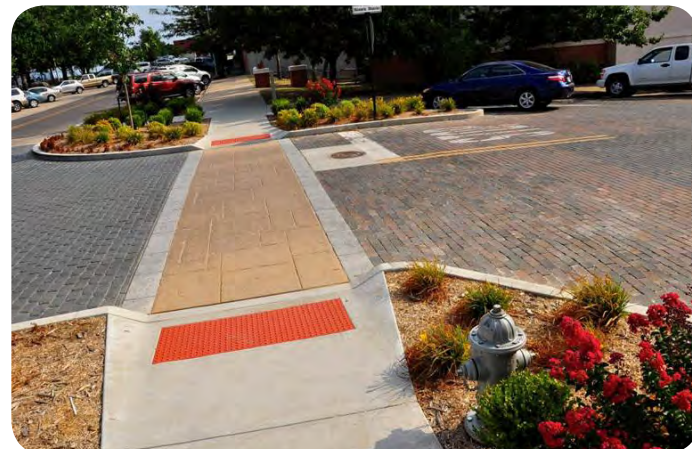


Curb radius reductions: A wide curb radius enables high-speed turning movements by motorists which can result in increased crashes with pedestrians and more serious outcomes when crashes occur. Reconstructing the

turning radius to a tighter turn will reduce turning speeds, shorten the crossing distance for pedestrians, and also improve sight distance between pedestrians and motorists.



Sight distance improvements: Improving sight distances for both pedestrians and motorists can increase pedestrian safety. Providing pedestrians with a clear view of approaching traffic at un-signalized intersections will help ensure that they have enough time to make a crossing when a gap in traffic appears. Similarly, ensuring that motorists have a clear view of pedestrians at crossings



can help increase yielding behavior toward pedestrians at un-signalized crossings.

High visibility crosswalks: High visibility crosswalks use specific marking patterns to increase the visibility of the crosswalk to approaching motorists. Traditional crosswalks have two lines perpendicular to the direction of motorist travel, and are often difficult for motorists to see. High visibility crosswalks use wider lines perpendicular to traffic, but also add wide lines parallel to the direction of motorist travel, which greatly increases the visibility of the crosswalk.



Transit Stop Locations

Concrete pads: A solid surface waiting area, typically a concrete pad, should be provided at all transit stops. At very low usage stops, the pad alone may be sufficient to provide a waiting area for transit users, although all stops should be evaluated for the need for benches or shelters. Pads provide a stable boarding area for transit users with disabilities, particularly those who may be using wheelchairs or other assistive devices. It is critical that the pads are

directly connected to nearby pedestrian facilities, and that they can be easily accessed by users with disabilities.



Other Treatments

Pedestrian Signage: Signage helps to improve pedestrian safety by alerting motorists that pedestrians may be present. Signage can also improve the visibility of pedestrian facilities at pedestrian crossings, such as a



marked crosswalk. To maintain a high quality of service, crosswalks at mid-block locations, and under some circumstances at unsignalized intersections, should include signage at a distance that allows a motorist to react and slow down if necessary.

Block Length: Block length can impact pedestrian safety. In particular, long blocks may encourage pedestrians to attempt mid-block crossings not at crosswalks. This increases the risk of a crash with a motor vehicle, particularly on multi-lane roadways. In new developments, overly long blocks should be avoided, and where they are included, formal mid-block crossings should be provided. In existing developments, mid-block crossings should be provided where there is reasonable pedestrian traffic and where there are specific destinations on one side of the street that encourage crossings.



BICYCLE FACILITIES NOT IN THE NCDOT COMPLETE STREETS GUIDE

Numerous bicycle facilities and treatments exist in addition to the bicycle facilities cited in the *Complete Streets Design Guidelines*. These facilities and treatments are briefly described below and should be included in the Pedestrian and Bicycle Facilities Toolbox. The facilities and treatments are divided into categories, but may be appropriate to use in settings other than the category they are included in.

Shared Roadway Facilities

Unmarked Wide Outside Lane: Lane widths that are 14 ft (4.3 m) or greater allow motorists to pass bicyclists without encroaching into the adjacent lane. However, bike lanes or paved shoulders are the preferred facilities on major roadways when sufficient width is available to provide those facilities. (AASHTO)



Bicycle Boulevards: Bicycle boulevards are streets with low motorized traffic volumes and speeds, designated and designed to give bicycle travel priority. Bicycle Boulevards use signs, pavement markings and speed and volume management measures to discourage through trips by motor vehicles and create safe, convenient bicycle crossings of busy arterial streets. (NACTO)



“Home Zone”: This concept originated in Denmark where it is known as a Woonerf, or “Street for Living.” These are



typically streets where vehicles are slowed by placing trees, planters, parking areas and other obstacles in the street. The street is intended for local traffic only; through traffic is discouraged. This makes a street available for public use that is essentially only intended for local businesses and/or residents. (FHWA)

On-Street Facilities

Buffered Bike Lanes: Buffered bike lanes are conventional bicycle lanes paired with a designated buffer space separating the bicycle lane from the adjacent motor vehicle travel lane and/or parking lane. The buffer allows for a safer and more comfortable ride for more types of bicyclists. A buffered bike lane is allowed as per MUTCD guidelines for buffered preferential lanes (NACTO)



Contra-Flow Bike Lane: Contra-flow bicycle lanes are bicycle lanes designed to allow bicyclists to ride in the opposite direction of motor vehicle traffic. They convert a one-way traffic street into a two-way street: one direction for motor vehicles and bikes, and the other for bikes only.

Contra-flow lanes are separated with yellow center lane striping. (NACTO)



Left-Side Bike Lane: Left-side bike lanes are conventional bike lanes placed on the left side of one-way streets or two-way median divided streets. Left-side bike lanes offer advantages along streets with heavy delivery or transit use, frequent parking turnover on the right side or other potential conflicts that could be associated with right-side bicycle lanes. Additionally, the reduced frequency of right-side door openings lowers the risk of a cyclist getting “doored.”



Advisory Bike Lanes: Advisory Bike Lanes are low-speed, low traffic volume streets with one narrow lane of two-way vehicular travel (no centerline) and bike lanes on either side indicated by a dashed white line. Passing vehicles are allowed to intrude on the bike lane if bicyclists are not present. Signage is necessary to instruct drivers and bicyclists on proper operation.



Uphill Climbing Lane: On streets where downhill grades are long enough to result in bicycle speeds similar to typical



motor vehicle speeds, a bike lane may be provided only in the uphill direction with shared-lane markings in the downhill direction. This design can be advantageous on streets where fast downhill bicycle speeds have the potential to increase the likelihood of crashes with fixed objects, particularly in locations with on-street parking. (AASHTO)

Cycle Track Bikeways

One-Way Cycle Track: One-way protected cycle tracks are bikeways that are at street level and use a variety of methods for physical protection from passing traffic. A one-way protected cycle track may be combined with a parking lane or other barrier between the cycle track and the motor vehicle travel lane. (NACTO)



Raised Cycle Track: Raised cycle tracks are bicycle facilities that are vertically separated from motor vehicle traffic. Many are paired with a furnishing zone between

the cycle track and motor vehicle travel lane and/or pedestrian area. A raised cycle track may allow for one-way or two-way travel by bicyclists. (NACTO)



Two-Way Cycle Track: Two-way cycle tracks are physically separated cycle tracks that allow bicycle movement in both directions on one side of the road. Two-way cycle tracks share some of the same design characteristics as one-way tracks, but may require additional considerations at driveway and side-street crossings. (NACTO)



Cycle Track Mixing Zone: The approach to an intersection from a cycle track should be designed to reduce turn conflicts for bicyclists and/or to provide connections to intersecting bicycle facility types. This is typically achieved by removing the protected cycle track barrier or parking lane (or lowering a raised cycle track to street level), and shifting the bicycle lane to be closer to or shared with the adjacent motor vehicle lane. At the intersection, the cycle track may transition to a conventional bike lane or a combined bike lane/turn lane. (NACTO)



Median Refuge Island for Bicycle Use: Median refuge islands are protected spaces placed in the center of the street to facilitate bicycle and pedestrian crossings. Crossings of two-way streets are facilitated by allowing bicyclists and pedestrians to navigate only one direction of traffic at a time. Medians configured to protect cycle tracks can both facilitate crossings and also function as two-stage turn queue boxes. (NACTO)



Bikeway Intersection Treatments

Two-Stage Turn Queue Box: Two-stage turn queue boxes offer bicyclists a safe way make left turns at multi-lane signalized intersections from a right side cycle track or bike lane or right turns from a left side cycle track or bike lane. Two-stage turn queue boxes may also be used at unsignalized intersections to simplify turns from a bicycle lane or cycle track, as, for example, onto a bicycle boulevard. (NACTO)

Combined Bike Lane/Turn Lane: A combined bike lane/turn lane places a suggested bike lane within the inside portion of a dedicated motor vehicle turn lane. Shared lane markings or conventional bicycle stencils with a dashed line can delineate the space for bicyclists and motorists within the shared lane or indicate the intended path for through bicyclists. (NACTO)



Intersection Crossing Markings: Intersection crossing markings indicate the intended path of bicyclists and alert



drivers to potential bicycles in the roadway. They guide bicyclists on a safe and direct path through intersections, including driveways and ramps. They provide a clear boundary between the paths of through bicyclists and either through or crossing motor vehicles in the adjacent lane. Many different crossing treatment combinations exist: dotted lines or “elephant feet” can be augmented with pavement color, bicycle symbols and/or chevron symbols. (NACTO)

On-Street Bikeway Intersection Crossings

Bicycle Signals: A bicycle signal is an electrically powered traffic control device that should only be used in combination with an existing conventional traffic signal or hybrid beacon. Bicycle signals are typically used to improve identified safety or operational problems involving bicycle facilities or to provide guidance for bicyclists at intersections where they may have different needs from other road users (e.g., bicycle only movements, leading bicycle intervals). (NACTO)



Active Warning Beacon for Bike Route Crossing at Unsignalized Intersection: Active warning beacons are user-actuated amber flashing lights that supplement warning signs at unsignalized intersections or mid-block crosswalks. Beacons can be actuated either manually by a push-button or passively through detection. Active warning beacons should be used to alert drivers to yield where bicyclists have the right-of-way crossing a road. (NACTO)



Rectangular Rapid Flash Beacons (RRFBs): RRFBs are a type of active warning beacon that use an irregular



flash pattern similar to emergency flashers on police vehicles. RRFBs can be installed on either two-lane or multi-lane roadways. (NACTO)

Hybrid Beacon for Bike Route Crossing of Major Street: A hybrid beacon, also known as a High-Intensity Activated Crosswalk (HAWK), consists of a signal-head with two red lenses over a single yellow lens on the major street and pedestrian and/or bicycle signal heads for the minor street. There are no signal indications for motor vehicles on the minor street approaches. Hybrid beacons were developed specifically to enhance pedestrian crossings of major streets. However, several cities have installed modified hybrid beacons that explicitly incorporate bicycle movements. (NACTO)



Off-Street Bikeway Midblock Crossings

Hybrid Beacon for Off-Street Path Crossings, Active Warning Beacons, and Rectangular Rapid Flash Beacons: These beacons can be applied at an off-road, multi-use path crossing where no nearby signalized intersections are present. (NACTO)



in conflict areas and in areas with pressure for illegal parking. Colored pavement can be utilized either as a corridor treatment along the length of a bike lane or cycle track or as a spot treatment, such as a bike box, conflict area or intersection crossing marking. (NACTO)



Additional Marking and Signing

Colored Bike Facilities: Colored pavement within a bicycle lane increases the visibility of the facility, identifies potential areas of conflict and reinforces priority to bicyclists

CONTEXT AND DESIGN CONSIDERATIONS

The purpose of this Toolbox is not simply to provide a comprehensive listing of treatments and facilities, but to provide planners and designers with a decision matrix so they can easily select the most appropriate treatments for a given situation. A detailed discussion of the context in which it is appropriate to use each treatment and specific design elements will help guide the selection of the best treatments for each situation. Providing the following information with each item in the Toolbox will allow planners and designers to select the appropriate treatment for the specific project they are working on.

Crash Modification Factors

Crash modification factors (CMFs) are multiplicative factors used to compute the expected number of crashes after implementing a given countermeasure at a specific site. The CMF is multiplied by the expected crash frequency without treatment. A CMF greater than 1.0 indicates an expected increase in crashes, while a value less than 1.0 indicates an expected reduction in crashes after implementation of a given countermeasure. For example, a CMF of 0.8 indicates an expected safety benefit; specifically, a 20 percent expected reduction in crashes. A CMF of 1.2 indicates an expected degradation in safety; specifically, a 20 percent expected increase in crashes.

Many of the facilities and design treatments listed in this chapter have known crash modification factors that demonstrate a reduction in crashes when the facility is implemented. Toolbox items that have positive crash modification factors associated with them (indicating a reduction in crashes) should be highlighted as priority facilities to implement when the context and need is appropriate.

Design Considerations

Location and context needs to be carefully examined when selecting the type of pedestrian or bicycle facilities that should be implemented in a given location. Even when considering a single street corridor, significant differences can exist from one end of the corridor to the other end, or even from block to block, that may require adjustments to the facilities being implemented. Factors such as the abutting land use, current and projected pedestrian and motor vehicle levels, the presence of schools, civic spaces, retail and other pedestrian and bicyclist attractors are some of the things that should be considered.

In addition to the design considerations cited above, the age and abilities of both pedestrians and bicyclists should be a primary consideration when selecting treatments. At a minimum, pedestrian facilities should meet all ADA requirements. Close attention should be paid to ensuring that the selected treatments meet the needs of youth, elderly and disabled pedestrians. These groups may require additional crossing time at intersections, among other design considerations.

It is important to recognize the types of bicyclists that will be served by specific facilities and ensure that facilities and treatments are provided to serve the full-spectrum of bicyclists. Bicyclists range from confident cyclists who are comfortable riding with motor vehicle traffic to more cautious cyclists who may be uncomfortable riding with much traffic to youths who may not have fully developed spatial and cognitive skills. While not every bicycle facility can serve all user types, it is important that the overall bicycle network meet the needs of all bicyclists and potential bicyclists in a community. For example, this may be accomplished by providing bicycle lanes on the main thoroughfare through a village while also providing a nearby parallel route that is comfortable and accessible for families or less confident cyclists. This parallel route may consist of a shared use path, a bicycle boulevard or another low-stress treatment. Chapters 3 and 4 of the 2012 AASHTO Guide for the Development of Bicycle Facilities provide significant information and context about bicycle operation and safety and the selection and design of on-road bicycle facilities.

Once specific facility types have been selected, they should be tailored for each specific location. The Toolbox should provide the basic starting point for each facility type, with minimum specifications for design, but the Toolbox should also emphasize that the minimum/standard design may not

be appropriate in all situations. The discussion presented for each potential facility type should be sufficient to aid an engineer's judgment as to whether a location is appropriate for the facility and considerations for its siting.

North Carolina Case Studies and Examples

Case studies and examples from North Carolina communities should be provided with as many Toolbox items as possible. Where examples or case studies from North Carolina are not available, examples from nearby states with a similar geographic and urban/rural mix as North Carolina should be provided. Efforts should be made to include examples from a mix of urban, suburban and rural communities, and urban examples should include large cities as well as smaller villages and towns. Examples from other locations in the United States may be appropriate if they offer particularly strong examples of specific facilities.

Urban, Suburban and Rural Considerations

The same facility may be implemented differently depending on the surrounding land use. NCDOT's road network passes through urban, suburban and rural areas, and a pedestrian or bicycle facility that is appropriate in one area may not be appropriate in another. The Pedestrian and Bicycle Facility Toolbox should note the appropriateness of each facility type for urban, suburban and rural areas as well as any special design considerations for each area type. This guidance should not be binding as there may be instances where a specific facility type is appropriate for an area it is not generally recommended for, but should allow planners and engineers to quickly ascertain which treatments and facilities are appropriate for the project area they are working on.

Design Resources

The Pedestrian and Bicycle Facility Toolbox should identify specific design resources for each treatment or facility. The resources should primarily include national and North Carolina guidance, including the resources noted at the beginning of this document.

Relevant Research

Details on relevant research for each item in the Pedestrian and Bicycle Facility Toolbox should be provided. This may include links to best practices for implementing specific facility types or research regarding safety improvements from specific facilities. Links to relevant research should be brief, but should note the primary conclusion of the research, and why it is important.

CONCLUSION

A detailed Pedestrian and Bicycle Facility Toolbox will serve as a resource for planners and designers who are seeking to implement the recommendations provided in the Complete Streets Design Guidelines. The Toolbox will be incorporated within the Roadway Design Manual and will build upon national-level pedestrian and bicycle facility design resources. The Toolbox will expand upon the facilities described in the existing Complete Streets Guidelines, while also introducing emerging treatments that are being used throughout the United States.

Most importantly, the new Pedestrian and Bicycle Facility Toolbox will present context-based design considerations so that project designers are well aware of considerations such as Crash Modification Factors, relevant research and examples of communities in North Carolina that have implemented specific facilities or design treatments.



7 Programming for Health, Safety, & Active Living

Adult cyclists learn proper signaling techniques

OVERVIEW

Charles Dickens got it right: “Walk to be healthy, walk to be happy.” Creating a safe and inviting bicycle and pedestrian transportation system requires attention to more than physical infrastructure; it requires a diverse toolkit of complementary programmatic recommendations that will enable people to walk and bicycle more, and lead healthier lives. Targeted education, encouragement, enforcement, and evaluation strategies that improve North Carolina residents’ health, safety, and their ability to incorporate walking and bicycling into everyday life are important as strategies that support the development and success of physical infrastructure. Successful programs must reach users and motorists in all different sectors of the population in North Carolina. A program may be presented as a campaign, effort, on-going initiative or one-time event, depending on its purpose. Every initiative should have a well-defined purpose or focus, a clearly identified goal (or goals), a lead agency/organization, and a logical timeline or schedule. In essence, these different efforts market walking and bicycling to the general public and ensure the maximum “return on investment” in the form of increased mode shift to walking and bicycling. As John Fitzgerald Kennedy once said, “Nothing compares to the simple pleasure of a bicycle ride.”

This Statewide Pedestrian and Bicycle Plan establishes the following vision for the future of pedestrian and bicycle transportation in North Carolina:

North Carolina is a place that incorporates walking and bicycling into daily life, promoting safe access to destinations, physical activity opportunities for improved health, increased mobility for better mobility, retention and attraction of economic development, and resource conservation for better environmental stewardship of our state.

In this Chapter

The Role of Advocacy Organizations

Bicycle and Walk-Friendly Communities

Education Programs, Initiatives, Strategies

Encouragement Programs, Initiatives, Strategies

Enforcement Programs, Initiatives, Strategies

Programmatic Recommendation Review Table

THE ROLE OF ADVOCACY ORGANIZATIONS

State and local advocacy groups have the opportunity to support bicycle and pedestrian safety, education, and outreach programs and initiatives. These efforts work in parallel to the efforts of NCDOT and can help further the reach and impact of NCDOT's programmatic strategies. North Carolina Active Transportation Alliance (NCATA) seeks to promote non-motorized transportation choices in North Carolina. Through partnerships with shop owners, bicycling clubs, transportation professionals, local advocacy organizations, and elected officials, NCATA promotes infrastructure, planning and education programs that improve conditions for people-powered transportation. Their vision for North Carolina is a state "where anyone can choose to bicycle, skate, run, and walk as normal, practical, healthy, safe and active transportation."

NCATA and local advocacy organizations should promote policies at the state level that will fairly and equitably accommodate bicyclists, skaters, wheelchair users, pedestrians, and others using human-powered active transportation. These organizations should also take a lead role in advocating for statewide support of Complete Streets concepts and other laws that improve bicyclist safety and for establishing dedicated funding sources for pedestrian and bicycle infrastructure in the state budget.

The first inaugural Bike Summit was held in 2012 in Raleigh and was well attended by public and private sector planners, cyclists, policy and decision makers and other related representatives in the transportation field. The NCATA, with the support of bicycle advocate volunteers and local government volunteers, should build on the momentum from the recent Bike Summit and host a statewide Bike

Summit in 2013. Statewide Bike Summits should be held every year, and as popularity and attendance continues to grow, a second event such as a "Bike to Legislature Summit" should be held each spring. Additionally, the NCATA should seek partnerships with health organizations and volunteer advocates to host a companion Walk Summit on an annual basis. The Walk Summit could begin as a one-day workshop and expand into a multi-day summit as attendance and awareness increases.

Example responsibilities of NCATA and local advocacy organizations:

- Generate awareness and support through champions, volunteers and community members at the local level to stimulate a grassroots movement.
- Start with Governor and State Assembly and recruit elected officials to champion the Active Transportation Cause.
- Avoid turning Active Transportation issues into a partisan issue.
- Find legislative support from all political parties.
- Build diverse coalitions consisting of health groups, chambers of commerce, safety, environment, older adults, recreation, realtors and other appropriate partners.
- Build constructive relationships with NCDOT and set up recurring meetings with staff.
- Be a resource - volunteer on committees, review policies and documents, consult on bike/walk projects, run publicly funded bicycle and pedestrian education classes.
- Offer public recognition to decision makers who institutionalize best practices.

The support of NCATA and local advocacy organizations such as Bicycling in Greensboro, Charlotte Area Bicycle





Alliance, Carrboro Bicycle Coalition, Durham Bicycle Coalition, Asheville on Bikes, Bicycle HaywoodNC, Connect Gaston, and Walkable Hillsborough Coalition will contribute to the successful implementation of the programmatic recommendations presented in this chapter. Specific opportunities for these partnerships are identified throughout this chapter; however, advocacy organization support should not be limited to these specific partnerships. NCATA and local advocacy groups are identified as potential partners for the implementation of several programmatic recommendations presented in this chapter.

BICYCLE AND WALK-FRIENDLY COMMUNITIES

Recognizing the importance of targeted programmatic strategies, the national Bicycle Friendly Community program (administered by the League of American Bicyclists), and the Walk Friendly Communities program (administered by the Highway Safety Research Center's (HSRC) Pedestrian and Bicycle Information Center (PBIC)), recommend a multi-faceted

walking school buses are educational and build confidence in children to safely walk to school.

approach based on five different "E" categories: Engineering, Education, Encouragement, Enforcement, and Evaluation. This Plan has been developed using the "5 Es" approach with an intent to provide action steps in each category that the State can take towards becoming more bicycle and pedestrian-friendly. In addition to the action steps recommended in this chapter, NCDOT can support North Carolina municipalities who wish to achieve a Bicycle and/or Walk Friendly designation by encouraging communities and providing guidance during the development of a Bicycle Friendly or Walk Friendly application.

This chapter organizes the efforts the State of North Carolina has taken to promote bicycling and walking into three primary categories, Education, Encouragement and Enforcement. The additional efforts that would be included in the Evaluation and Engineering categories are included and reported on in other sections of this Plan. Recommendations presented in the following pages align with the vision and goals of this Plan and are approached in two ways: A) as recommendations to improve on existing efforts, and B) as recommendations for new targeted strategies. Partnership and facilitation support guidance is included with each recommendation. NCDOT should enlist the support and assistance from these partners and actively engage them throughout the development and implementation of each initiative.

EDUCATION PROGRAMS, INITIATIVES, STRATEGIES

Providing bicycle and pedestrian educational opportunities is critical for bicycle and pedestrian safety. Education should span all age groups, cultures, abilities, and include motorists as well as current and potential cyclists and pedestrians. The focus of an educational campaign can range from information about the rights and responsibilities of road users, to tips for safe behavior; from awareness of the community-wide benefits of bicycling and walking, to technical trainings for agency staff.

Purpose

One of the goals of this Plan is to develop and implement educational programs for all road users to increase safety, awareness, and understanding of pedestrian and bicycle rights, responsibilities, and benefits. Every year, on average, 168 pedestrians and 24 bicyclists are killed on North Carolina roadways. Through improvements to existing and past educational programs and development of new statewide education programs, NCDOT will increase safety and reduce the number of fatal pedestrian and bicycle crashes each year. Attention should be given to prioritizing educational campaigns in underserved communities, children, and among populations who are more likely to walk and bicycle for necessity.

Another goal of this Plan is to “coordinate transportation and land use planning to provide safe walking and bicycling connections between neighborhoods, employment centers, commercial centers, schools, parks, and other popular destinations and places that serve the community.” By providing educational programs for decision-makers, engineering and planning staff representatives, NCDOT is cultivating the expertise and skill sets needed to develop state of the art bikeways, walkways, and greenways for the short- and long-term future of North Carolina's bicycling and pedestrian environment.

Existing and Past Efforts

Bicycle Helmet Initiative

Introduction: Since its inception in 1974, NCDOT's Division of Bicycle and Pedestrian Transportation has been committed to encouraging the use of bicycle helmets as an essential

means of reducing bicyclist injuries and fatalities. Over the last twenty years, the DBPT has undertaken a series of helmet promotions in collaboration with other organizations and agencies across North Carolina. The Bicycle Helmet Initiative is designed to reduce bicycle related injuries and fatalities of children, as well as encourage behaviors that will lead to bicycle helmet usage as an adult.

Today, communities conducting bicycle safety events for underprivileged children can request helmets through the DBPT's Bicycle Helmet Initiative. The program is funded through proceeds from “Share the Road” license plates. While the DBPT does not actively promote the initiative, most agencies and schools are aware of the program and regularly request helmets. A maximum of 24 helmets is available per year to each agency that requests helmets. Helmet availability is determined on a “first come first serve” basis.

Type: Ongoing

Action Item/Recommendation: Increase funding of the Bicycle Helmet Initiative program to increase the number of helmets available per agency each year and to broaden the number of agencies served each year. The increased funding can come from a diversified funding stream. In addition to using “Share the Road” license plate revenues, pursue public health funders in the private and public sectors.

Lead Facilitator(s): North Carolina Department of Transportation, in partnership with the Department of Public Instruction (DPI); the Department of Health and Human Services (DHHS); the Department of Insurance's NC Safe Kids; local health departments; hospitals; and advocacy groups



Let's Go NC - Bicycle and Pedestrian Curriculum

Introduction: Let's Go NC is a bicycle and pedestrian safety skills program for children in North Carolina. The bicycle component of the curriculum is based on the 1990's Basics of Bicycling Curriculum, developed for fourth and fifth graders. The pedestrian component is based on the NTSHA pedestrian curriculum. Both components are modified for North Carolina and for use to instruct children in grades k-5. The program encourages children to be healthy and active by teaching the skills necessary for safely participating in bicycling and walking activities. The curriculum is currently under development and includes Safe Routes to School components, classroom curriculum materials, and videos and exercises. Let's Go NC is based on an earlier NCDOT program called "The Basics of Bicycling."

Type: Ongoing

Action Item/Recommendation: Establish a formal partnership with the Department of Public Instruction to implement Let's Go NC. The partnership agreement should include specific goals and a target timeline for increasing funding for the program, assigning one staff at each agency to serve as a point person

Parents gather with their kids to help children learn about riding bicycles safely to school in Southern Pines, NC ▼

for program implementation, and engaging North Carolina schools in the process. The partnership should establish a goal of every elementary school in North Carolina adopting the Let's Go NC curriculum. The curriculum should include training for educators who will be responsible for encouraging and educating students during the program's curriculum. With the assistance and support of NCATA or local advocacy organizations, materials should be developed and provided free of charge to schools and non-profits. These materials would be used to educate students on fun and safe ways to walk and bike to school.

Lead Facilitator(s): North Carolina Department of Transportation, in partnership with the DPI; NC Safe Kids; NCATA; and local advocacy organizations

Safety Education Materials

Introduction: NCDOT's Division of Bicycle and Pedestrian Transportation offers safety and education materials on the agency website. The materials target specific age groups and are organized by the targeted age level. The program offers an assortment of pamphlets, handouts, tests, curricula, information sheets, posters and other items for each age level. This program is not actively marketed and is primarily distributed based on



direct requests from schools. The program teaches children to become conscientious road users.

Type: Ongoing

Action Item/Recommendation: The development of Safety Education Materials is an important statewide education program, but need not be repeated as a unique effort. This Plan recommends focusing on furthering the development and statewide implementation of the Watch for Me NC program, including the development of appropriate digital materials for different age levels, all abilities, and cultures. Watch for Me NC is described later in this chapter, and is a safety awareness and education program that launched in 2012.

Lead Facilitator(s): N/A

Share the Road Posters

Introduction: NCDOT continually reinforces the message that motorists and bicyclists must “Share the Road” responsibly. To promote this effort, three “Share the Road” posters are available online for order or download. The three posters reflect three distinct messages: “Be Responsible,” “Bicycle Safety Month,” and “Be Predictable.” The poster messages were designed to appeal to different audience ages and were last updated in 2009.

Type: Ongoing

Action Item/Recommendation: Update the existing “Share the Road” posters and incorporate them into a broader “Share the Road” campaign for the state. The broader program should include a video PSA distributed widely online (such as through YouTube and/or Vimeo), to local network TV stations, and to local government access cable

channels. The statewide effort may also include print materials (such as a brochure or postcard-size handout) and printed versions of the posters. If printed materials are developed, a marketing plan for distributing the materials in a targeted and timely manner is necessary. The plan would identify partner agencies and institutions that could actively distribute the materials to a target demographic group and at major events where NCDOT staff or partner groups are available to distribute materials to a broad audience of North Carolina bicyclists and motorists.

Lead Facilitator(s): North Carolina Department of Transportation in partnership with NCATA; and local advocacy groups

Safe Routes to School Community Workshop

Introduction: NCDOT's Safe Routes to School (SRTS) Program offers a customized version of the “Safe Routes to School National Course,” developed by the National Center for Safe Routes to School and the Pedestrian and Bicycle Information Center. Designed to help communities develop sound SRTS programs based on their unique local context, this one-day event provides information on best practices, useful strategies, and available resources. When offered, over 100 individuals participated.

Type: Episodic

Action Item/Recommendation: Establish a formal partnership with the Department of Public Instruction to host a SRTS Workshop in all communities of North Carolina within a specific timeframe (such as five years) and create a strategy for achieving that goal. Collaborate with the Department of Public Instruction to promote the workshop to schools and to schedule workshops for multiple



communities within a region at the same time. This could come in the form of a “SRTS Workshop Week,” which would offer five workshops over five days in five communities of a specific region, or a similar implementation strategy. Increase funding for the SRTS Community Workshop program to a level that provides sufficient staffing and resources to achieve the goal.

Lead Facilitator(s): North Carolina Department of Transportation in partnership with the DPI

Bicycle Planning and Design / Pedestrian Planning and Design Workshops

Introduction: NCDOT's Division of Bicycle and Pedestrian Transportation hosts a one-day Bicycle Planning and Design Workshop providing comprehensive information on the latest in bicycle planning, design standards, and research. The workshop offers guidance on integrating bicycle transportation needs into roadways and shared-use paths to enhance the “bike-friendliness” of a community. The DBPT has offered the course multiple times since 2006 and has over 100 participants.

NCDOT's Division of Bicycle and Pedestrian Transportation hosts a one-day Pedestrian Planning and Design Workshop providing comprehensive information on the latest in pedestrian planning, design standards, and research. Instructors present best practices for enhancing pedestrian access, innovative pedestrian treatments, sidewalk design, signalization and signing, ADA considerations, street crossings, transit interface, and NCDOT policies, standards and guidelines. The DBPT last offered the course in 2005 and had over 100 participants.

Type: Episodic

Action Item/Recommendation: Bicycle Planning and Design Workshops are an important program, and should be continued

as “Complete Streets Workshops”. NCDOT recently launched its Complete Streets training program and “Complete Streets Workshops” that combine bicycle and pedestrian planning and design concepts should be offered. They should be held after the initial round of training seminars to offer regional and local staff opportunities for continued education and training, especially as Complete Streets concepts continue to evolve.

Lead Facilitator(s): North Carolina Department of Transportation in partnership with regional planning organizations (MPOs, RPOs, COGs); and local municipalities

Designing Pedestrian Facilities for Accessibility

Introduction: NCDOT's Division of Bicycle and Pedestrian Transportation hosts a day-and-a-half workshop, developed by the Federal Highway Administration and the Association of Pedestrian and Bicycle Professionals (APBP). The program provides an overview of the Americans with Disabilities Act (ADA) and provides detailed information on policies and design guidance related to accessibility. The Division last offered the course in 2006.

Type: Episodic

Action Item/Recommendation: Training related to designing pedestrian facilities for accessibility is an important programmatic element, but need not be repeated in this format. This Plan recommends that NCDOT focus on providing pedestrian accessibility planning and design training as part of the Complete Streets training program being offered in the fall of 2012, and workshops mentioned previously in this chapter.

Lead Facilitator(s): N/A

Streetwise Cycling - Guide to Safe Bicycling in North Carolina

Introduction: The purpose of NCDOT's Streetwise Cycling Guide is to explain the rights and duties of bicyclists as vehicle operators on North Carolina's roads. The guide also includes information on riding with traffic, handling skills, and equipment. The material is not actively marketed by NCDOT, but is available online.

Type: Ongoing

Action Item/Recommendation: Update the Streetwise Cycling – Guide to Safe Bicycling North Carolina. The guide is targeted to adult bicyclists and provides an important complement to the age-specific educational materials provided for children and youth. The material should be updated bi-annually, in conjunction with updates to the Guide to NC Bicycle and Pedestrian Laws (description on page 7-22) and should be made available online, along with other materials. NCDOT should assign the role of updating the manual to a specific staff person within the agency to ensure the information is updated every two years. That staff person should also establish opportunities for promoting the manual and any associated online resources within existing NCDOT programs, such as the Complete Streets training program and the Planning Grant Initiative.

Lead Facilitator(s): North Carolina Department of Transportation in partnership with NC Safe Kids

Pedestrian Safety Roadshow

Introduction: In 1998, NCDOT's Division of Bicycle and Pedestrian Transportation trained facilitators to lead

Pedestrian Safety Roadshows across the state. The objectives of the program were to increase awareness of pedestrian safety and walkability concerns, provide participants with information about the elements that make a community safe and walkable, and channel community concerns into a plan of action for addressing pedestrian issues. The trainings focused on ways to get communities involved in developing and promoting bicycle and pedestrian safety and improving the walking and biking environments in their neighborhoods. Training was setup as a "train the trainer" program to train planning, transportation, health, architecture, community development, and other interested professionals on how to conduct a Pedestrian Safety Roadshow in their community. 15 trainers participated in two 3-day course sessions, held in 4 locations each time. Training included two days of training for a Roadshow, with visuals, handouts and field observations at several locations to demonstrate design concepts. On the third day of training, trainees conducted mini Roadshows under observation and evaluation. The Pedestrian Safety Roadshow, was developed by the Federal Highway Administration (FHWA) in conjunction with the National Highway Traffic Safety Administration (NHTSA).

Type: Episodic (Discontinued)

Action Item/Recommendation: The Pedestrian Safety Roadshow training and events were a success, but need not be repeated. This Plan recommends focusing on other tools (such as the Complete Streets Workshops previously described in this chapter) for educating community leadership about strategies for creating bicycle and walk friendly environments.

Lead Facilitator(s): N/A





Bicycle skills for the road are learned through training and riding in groups, as seen here. ▲

Walkable Communities Conferences

Introduction: In 1997, NCDOT's Division of Bicycle and Pedestrian Transportation sponsored a series of regional Walkable Communities Conferences. The conferences explored the concept that walking is part of every trip and is the most accessible form of transportation for people of all ages. Well-known national speakers shared their experiences and ideas with more than 1,000 people across the state and developed strategies for applying the concepts in their communities.

Type: Episodic (Discontinued)

Recommendation: The Walkable Communities Conferences were a success, but need not be repeated. This Plan recommends focusing on other tools (such as the Complete Streets Workshops previously described in this chapter) for educating community leadership about strategies for creating bicycle and walk friendly environments.

Lead Facilitator(s): N/A

Workshops and Webinars

Introduction: The Institute for Transportation Research and Education (ITRE) at North Carolina State University provides training specifically for employees of NCDOT. The two training programs currently available are: Fundamental Engineering Principles (FEP) and Highway Engineering Concepts (HEC). In the past, NCDOT contracted with ITRE to provide up to seven day-long workshops on topics including bicycle facility design, liability in design, traffic calming, planning and design for pedestrians, and designing pedestrian facilities for accessibility (compliance with American with Disabilities Act). When offered, over 100 NCDOT staff members participated in the program. Through a contract with the Highway Safety Research Center, these workshops will be held as part of the Complete Streets training program.

Type: Episodic

Action Item/Recommendation: Partner with the Office of State Personnel to ensure that all relevant agency staff are included

in the Complete Streets training program. Beyond NCDOT, relevant agencies may include the Department of Crime Control and Public Safety, the Department of Environment and Natural Resources, the Department of Health and Human Services, and the Department of Public Instruction.

Lead Facilitator(s): North Carolina Department of Transportation in partnership with the Office of State Personnel

Bicycle Rodeo Kit

Introduction: Bicycle rodeos are a hands-on educational tool for training youth in on-bike skills and safety through a fun and interactive event. Similar to the community guide for bicycle events, NCDOT created the Bicycle Rodeo Kit to provide guidance and encouragement for communities seeking to host youth bicycle safety events. The kit includes a bicycle rodeo manual and is based on materials developed for a similar program in Colorado. The Kit is available online only and has not been updated.

Type: Ongoing

Action Item/Recommendation: Allocate funding to revamp the existing Bicycle Rodeo Kit with the specific goal of updating the entire document to: 1) be specific to North Carolina; 2) reflect current trends and attitudes among North Carolina youth; and 3) reflect current best practices in bicycle safety curriculum. This Plan recommends that NCDOT promote the updated Bicycle Rodeo Kit as part of its statewide Safe Routes to School efforts and through the Planning Grant Initiative (specifically incorporating the kit into bicycle plans developed with Planning Grant Initiative funds). Revamped Kits could be shared between NCDOT Division Offices until each office has their own Kit. Additional, mini-grants could be available to each Division

Office to purchase the materials needed to update or revamp their original Kit.

Lead Facilitator(s): North Carolina Department of Transportation

New Program Recommendations

Bicycle Law Enforcement Education for Police

Introduction: Most law enforcement professionals do not receive training specific to bicycle laws, handling, or safety. Police education courses or training can help officers improve public safety and enforce existing laws more effectively by providing them with the training they need.

Action Item/Recommendation: Comprehensive trainings should be offered to municipal police department, county sheriff departments and the State Highway Patrol. These trainings should include comprehensive information about laws and statutes pertaining to bicycling; information about common crash types and causes, and how to prevent and enforce against the most serious offenses; knowing options for enforcement and education (e.g. when a citation vs. warning should be issued, diversion class options, and safety materials that can be handed out during a traffic stop or public event). The program will also be useful to police departments who wish to do educational outreach to the bicycle community and relevant organizations. Incorporating skills training and certification to officers who wish to patrol on bicycle could also be included in these courses. The presence of police officers on bicycles will discourage bike lane incursions by motor vehicles, and will assist the officers with enforcing traffic violations by bicyclists. More information on the Chicago Bikes program for police education can be found online at: http://www.chicagobikes.org/video/index.php?loadVideo=police_training_2009.



Type: Ongoing

Lead Facilitator(s): North Carolina State Highway Patrol in partnership with municipal and county police departments

Statewide Bicycle Skills Training for Adults

Action Item/Recommendation: Bicycle Skills Training Courses should be developed and offered to adult cyclists of all levels who wish to learn bicycling technique, how to navigate busy roads and complex junctions, and how to teach their children the proper and safe way to ride a bicycle. Courses that are taught as a series of 3-hour, on-bike classes on the weekends would most likely be convenient for the majority of adults. The League of American Bicyclists (LAB) offer excellent resources on proper bicycling practices and have League Cycling Instructors (LCIs) that teach courses to suit the needs of any cyclist. There are 52 LCIs in North Carolina. More information can be found online: <http://findit.bikeleague.org/search/>.

Type: Ongoing

Lead Facilitator(s): North Carolina Department of Transportation in partnership with the LAB; and local municipalities

"Train the Trainers" - Bicycle Skills Training for Child Care Personnel

Action Item/Recommendation: Bicycle Skills Training Courses to "train the trainers" should be developed and offered to program managers and other personnel who will be incorporating bicycle skill training elements into child care program curriculums such as after school programs and summer camps. The 2012 Bicycle and Pedestrian Curriculum includes care giver instruction and should be accepted as the state standard for child care agencies. Curriculums should include training for

safe bicycling technique, and how to navigate busy roads and complex junctions for all experience levels. These could range from one-time, three-hour intensive trainings, to a week-long series of daily two-hour trainings as part of child care programs, to full-week bike adventure camps. The skills training could also be incorporated into the physical education curriculum in elementary schools and middle schools.

Type: Ongoing

Lead Facilitator(s): North Carolina Department of Transportation in partnership with DHHS, Department of Public Instruction, local municipalities and school districts

Drivers Education Training

Action Item/Recommendation: Driver's education directed toward all motorists, whether as part of a driver's education course in school or a driving safety course for adults, and including applicable laws, roadway positioning of cyclists, traffic and hand signals, principles of right-of-way and left and right turn problems should be taught to increase the safety of the motorist as well as cyclists and pedestrians. The training should cover rules of the road for motorists, cyclists and pedestrians. All Drivers Education tests should include at least three questions related to bicycles. NCATA should assist the efforts of NCDOT and lobby to improve the state driver's license test to include testing driver's knowledge of motorist responsibilities to cyclists.

Type: Ongoing

Lead Facilitator(s): North Carolina Department of Transportation in partnership with the DPI; local municipalities; school districts; NCATA; and local advocacy organizations

Bicycle and Pedestrian Facility Design Seminars

Action Item/Recommendation: The State should continue to provide training to NCDOT Design staff, NCDOT Engineering staff and NCDOT Maintenance staff for state-of-the-art bicycle facility design and engineering techniques. The seminars should be facilitated in collaboration with the University of North Carolina and other educational institutions. Seminars should include discussion of different available design manuals (AASHTO, NACTO, Complete Streets, etc.) and seminar agendas should be continually updated based on current adopted/accepted design standards.

Type: Ongoing

Lead Facilitator(s): North Carolina Department of Transportation in partnership with the University of North Carolina campuses

level encouragement directed first at US Marine Corps soldiers, but ultimately inspired the Nation. Encouragement programs can range from national challenges like the 50-mile hike, to work-place commuter incentives, to a “walking school bus” at an elementary school; and from bicycle- and walk-friendly route maps, to the creation of a bicycle co-op.

Purpose

According to a 2008 survey by The National Highway Traffic Safety Administration, “71% of Americans said they would like to bicycle more than they do now”. As bicycle and pedestrian infrastructure improvements are made, NCDOT must simultaneously develop targeted strategies for encouraging North Carolinians to engage in bicycling and walking activities and communicate information about safe and inviting places for bicycling and walking. Improving upon existing encouragement programs and developing new encouragement programs that promote transportation and recreation choices and healthy, active lifestyles are important steps toward meeting the goal to “integrate pedestrian and bicycle facilities with all other travel modes (personal vehicle, bus, train, airplane, etc.) to form an interconnected transportation network with efficient and convenient connections between modes.”

ENCOURAGEMENT PROGRAMS, INITIATIVES, STRATEGIES

Encouragement programs are critical for promoting and increasing walking and bicycling. These programs should address all ages, abilities, and user groups from school children, to working adults, to the elderly and also address recreation and transportation users. The goal of encouragement programs is to increase the amount of bicycling and walking that occurs in a community. Through history, all levels of leadership from neighborhood leaders to Presidents of the United States of America have encouraged Americans to increase their physical activity, and walking more or bicycling more is a simple way to do so. President Kennedy's 50-mile hike is an example of national



Existing & Past Efforts

Bicycle/Pedestrian Commuter Incentive Programs

Introduction: The SmartCommute Challenge is an annual campaign coordinated by GoTriangle and SmartCommute@rtp. From September 1 to October 15, Triangle commuters are encouraged to try an alternative commute (not driving alone) to work or campus such as riding the bus, carpooling, vanpooling, teleworking, biking, or walking. These free ride-matching services are provided by the “GoTriangle” agencies and participating statewide agencies. Participation in any of the offered services is voluntary. Every Monday starts a new work week and a new challenge. Winners of the weekly challenge are announced on the website the following week. Private sponsorships provide funding for the prizes and Transportation Demand Management staff in the Triangle region dedicate time to administering the program annually.

In the past, pledge cards were used and a follow up survey was sent out to gather information to report on the success of the program and total Vehicle Miles Traveled (VMT) and emissions reductions. The program has been a great success for many years, however, recently there has been a decline in participation. This program is no longer new and exciting so the program is being reinvented as an ongoing tracking and incentive program called GoPoints to attract new commuters and get them to form the habit of sustainable commuting. A loyalty program called GoPerks for existing SmartCommuters is also under development. Short-term challenges will be released throughout the year to continue to grow excitement and get people to join the program.



▲ The NC State Cycling Team

Type: Ongoing

Action Item/Recommendation: NCDOT should follow the model provided by Triangle Transit's Smart Commute Challenge. Using a local or regional pilot program as a basis for building a statewide program is a cost-effective means of capitalizing on the state's existing resources. Allocate funding to work with Triangle Transit to customize Smart Commute Challenge materials for other regions of the state. Promote the program as a new strategy that local and regional transit agencies can employ to encourage multimodal travel. NCDOT should act as a program promoter, provide seed funding for agencies beginning a program, and provide technical assistance for communities interested in replicating the Triangle Transit Smart Commute Challenge model. Local or regional transit agencies would act as program administrators.



- ▲ Bicycle parking provides encouragement and convenience for bicyclists.

Lead Facilitator(s): Local/regional transit agencies in partnership with the North Carolina Department of Transportation; and Triangle Transit

Safe Routes to School Program

Introduction: North Carolina's Safe Routes to School (SRTS) programming is a statewide infrastructure tool that can be used to transform communities and develop inter-agency cooperation for mutually reinforcing investments, such as in the case of school siting, comprehensive planning, etc. Since 2007, NCDOT has awarded 81 SRTS projects impacting 135 school areas across the state. Fifty of these

projects improve infrastructure within two miles of select schools through building sidewalk, marking crosswalks, installing pedestrian signal heads, constructing shared-use paths, striping bike lanes and more. Fifteen communities have pursued non-infrastructure projects enabling them to offer bicycle and pedestrian safety skills trainings; launch walking school bus or bicycle train programs; establish safety patrol or crossing guard programs; or other similar education, enforcement, and encouragement activities. One key outcome of the SRTS program is the development of SRTS Action Plans.

Type: Ongoing

Action Item/Recommendation: Establish a North Carolina Safe Routes to School program "learning network", with a website and online digital materials to communicate current and future initiatives, provide direct access to educational materials and technical assistance, and encourage community participation in Safe Routes to School efforts. Mentorship opportunities between communities that have successfully implemented SRTS initiatives and communities who wish to implement SRTS initiatives should be encouraged and nurtured by NCDOT and/or NCATA. NCDOT should secure a unique URL for the website that will be marketable and memorable for North Carolina citizens (the website could exist as a webpage of www.ncdot.gov while seamlessly redirecting visitors by way of the chosen URL). Increase funding and personnel for the Safe Routes to School program so that sufficient staff time is available to promote the program statewide, maintain the website content and SRTS materials, and handle administrative duties related to processing and evaluating SRTS grants. The added personnel could come in the form of allocating a set amount of time of an existing staff member towards SRTS.



Lead Facilitator(s): North Carolina Department of Transportation in partnership with NCATA; and local advocacy groups

Bicycle Events - A Community Guide

Introduction: NCDOT offers a community guide to hosting bicycle events. The 32-page booklet outlines suggested bicycle events and promotions. It includes information on how to mobilize community resources and how to work with the media. The guide is available online only and has not been updated.

Type: Ongoing

Action Item/Recommendation: Local bicycling events are an important component of creating or supporting a bicycle friendly environment, however NCDOT's community guide has had a limited role in increasing the number of events or improving the quality of events hosted in the state. This Plan recommends allocating funding to enhance and re-release the community guide with updated guidance and fresh ideas to inspire communities who are planning bicycle events and promotions.

Lead Facilitator(s): North Carolina Department of Transportation in partnership with existing established Bicycle and Pedestrian Advisory Commissions (BPACs)

New Program Recommendations

Bicycle Parking Installation

Action Item/Recommendation: The State should encourage local municipalities to update local zoning, licensing, and permit processes that designate the types and numbers of bicycle parking required at private employment and retail facilities. These facilities should offer bicycle parking in safe, well illuminated areas, and near entrances. Providing secure bicycle parking is a key ingredient in efforts to encourage bicycling as a form of transportation. Placing long-term bicycle parking at transit stations provides opportunities for multi-modal travel and supports alternative transportation choices. The State should offer training for local municipalities to understand the benefits of offering bicycle parking, and provide sample/template municipal and/or zoning code language that could be used to implement this program at the local level.

Type: Ongoing

Lead Facilitator(s): North Carolina Department of Transportation in partnership with municipalities; and regional planning organizations (MPOs/RPOs/COGs)

Safe Routes to School (Regional Plans)

Safe Routes to School Programs are bolstered by the development of a collaborative approach to the program, rather than separate efforts led by individual schools. Encouraging the development of regional Safe Routes to School Plans allows communities to set a benchmark that all elementary schools in the area take part in the program over a specified period of time. The State's Safe Routes to School

Coordinator should work with different regions to leverage resources as they develop plans for implementation of this program. This program expands on the State's existing, successful SRTS program.

Type: Ongoing

Lead Facilitator(s): North Carolina Department of Transportation's SRTS Project Manager and the SRTS Regional Coordinators

Walking Programs

Action Item/Recommendation: Walking programs such as a "Weekend Walkabout" are regularly occurring events that promote walking while also bringing attention to pedestrian infrastructure. "Weekend Walkabouts" could be scheduled and held in each region of the State in conjunction with the statewide Walk to School Day that takes place each fall. The events' walking routes should highlight safe and inviting places to walk in the public realm (rather than private or enclosed facilities such as walking tracks) and should be three miles or less in length. These events are ideal for families and seniors.



◀ National Walk to School Day is a positive way to encourage walking. Here in Holly Springs, NC.

Different walking programs may be organized based on themes for each event, such as an architectural tour, a “Steeple Chase” tour (visiting historic churches), a tour of parks, neighborhood strolls, etc. To generate added marketing potential, that State should engage local celebrities to lead a walk and help raise awareness for the event.

The State should partner and coordinate with municipalities who have adopted pedestrian plans that were developed as part of the NCDOT Bicycle and Pedestrian Planning Grant initiative to host and showcase local walking programs. The State should support the community by providing ideas, materials, and helping the community communicate with local contacts who could assist with the event.

Type: Ongoing

Lead Facilitator(s): North Carolina Department of Transportation in partnership with local municipalities

Open Street Events

Introduction: Open (or “Car-free”) Streets events have many names: Sunday Parkways, Ciclovias, Summer Streets, and Sunday Streets. The events are periodic street “openings” (i.e., “open” to users besides just cars; usually on Sundays) that create a temporary park open to the public for walking, bicycling, dancing, hula hooping, roller-skating, etc. They have been very successful internationally and are rapidly becoming popular in the United States. Open street events promote health by creating a safe and attractive space for physical activity and social contact, and are cost-effective compared to the cost of building new parks for the same purpose. Events can be weekly events or one-time occasions, and are generally very popular and well attended.

Action Item/Recommendation: Open street events attract a local audience and should be hosted by a municipality, with the support of NCDOT.

For future expansion of the program, organizers should consider lessons learned and best practices from other communities. Some recommendations include:

- Make sure that there are programmed, family-friendly activities along the route; an “open street” alone is not sufficient to draw participants (and especially not on a repeat basis).
- These events lend themselves to innovative partnerships and public/private funding. Health care providers whose mission includes facilitating physical activity are often major sponsors. Businesses may also support the event if it brings customers to their location.
- The cost of organizing the event can be mitigated through volunteer participation, as this type of event lends itself to enthusiastic volunteer support. However, this will require a high level and quality of volunteer recruitment and management to be sustainable in the long run.
- Police costs to manage the road closure will be one of the largest costs. Work with the police to develop a long-term traffic closure management strategy that uses police resources where needed but also allows well-trained volunteers to participate in managing road closures.
- The greatest value to the community comes when a ciclovía event happens on a regular basis (e.g. monthly during pleasant weather months). For this to be successful, different routes and/or different activities should be considered.

Program Resources:

- Open Streets Guide (includes networking opportunities and organizers guide): <http://openstreetsproject.org/>
- Videos of Open Streets events: <http://www.streetfilms.com>

org/tag/ciclovias/

Sample Programs:

- Atlanta Streets Alive (GA): <http://www.atlantabike.org/atlantastreetsalive>
- Bull City Open Streets (NC): <http://bullcityopenstreets.com/>
- 2nd Sunday on King Street (SC): <http://susanlucas.typepad.com/secondsundayonkingstreet/>

Type: Ongoing

Lead Facilitator(s): North Carolina Department of Transportation in partnership with the Department of Commerce; Department of Crime Control and Public Safety; North Carolina State Highway Patrol; municipal and county police departments; local political jurisdictions; and local municipalities

Campus Commuter Program

Introduction: College and university students, faculty, and staff are a sector of the population with commute patterns to and from and around campuses that are conducive to active transportation. Many institutions of higher education are realizing the benefits that active transportation programs offer towards campus-wide transportation demand management and parking services. By encouraging students and faculty to commute to school by an alternative to an automobile, there will be a reduction in automobile emissions, a reduction in Average Daily Traffic (ADT) on roadways that connect to campuses, and there will be a reduction in the need for additional on-campus parking spaces.

There are colleges and universities in North Carolina that are either already designated Bicycle Friendly Universities, or are working toward designation. There are opportunities to build upon existing momentum and support for travel by bicycle.

A campus commuter program should provide resources and information for commuting to campus by biking, walking, or transit and offers incentives to students, faculty and staff that commute by means other than a car.

Action Item/Recommendation: The University of North Carolina should implement campus commuter programs and lead the way for other institutions in North Carolina. The NCATA should support this program to raise awareness about motor vehicle, pedestrian and bicyclist fatalities. The NCATA should develop and provide presentations and materials for distribution to incoming college students during Fall orientation.

Example “starter” programs that could lead to the development of a campus commuter program:

- University of South Carolina's “Travel Lightly Day” <http://www.dailygamecock.com/index.php/multimedia-11/item/4217-usc-community-travels-lightly-to-promote-health-sustainability>
- Ripon College Freshmen Receive Free Bicycle in Exchange for a “No-Car Pledge” <http://www.jsonline.com/news/education/32585109.html>
- Yay Bikes! / Ohio DOT “This is How We Roll” <http://howwerollosu.com/about-hwr.htm>

Other example bicycle commuter programs:

- http://transportation.stanford.edu/alt_transportation/Commute_Club.shtml
- <http://www.washington.edu/facilities/transportation/commuterservices/about>
- <http://www.activateomaha.org/igsbase/igstemplate.cfm?SRC=DB&SRCN&GnavID=11&SnavID=27>



More information on the Bicycle-Friendly University Program by the League of American Bicyclists:

The Bicycle Friendly University (BFU) program recognizes institutions of higher education for promoting and providing a more bicycle-friendly campus for students, staff and visitors. The BFU program provides the roadmap and technical assistance to create great campuses for cycling.

College and university campuses are unique environments for their high density, stimulating atmosphere and defined boundaries. These factors make them ideal environments to incorporate bikes. Many colleges and universities have built upon these good conditions and embraced the enthusiasm for more bicycle-friendly campuses by incorporating bike share programs, bike co-ops, clubs, bicycling education classes

▼ *Bicycle enforcement provides encouragement and enforcement.*



and policies to promote bicycling as a preferred means of transportation. With the goal to build on this momentum and inspire more action to build healthy, sustainable and livable institutions of higher education, the League created the Bicycle Friendly University program.

The Bicycle Friendly University program evaluates applicants' efforts to promote bicycling in five primary areas: engineering, encouragement, education, enforcement and evaluation/planning. Applications must be submitted online. (http://www.bikeleague.org/programs/bicyclefriendlyamerica/bicyclefriendlyuniversity/bfu_about.php)

Type: Ongoing

Lead Facilitator(s): North Carolina Department of Transportation in partnership with University of North Carolina campuses; NCATA; League of American Bicyclists; and local advocacy organizations

National Bike Month and Walk to School Day Support/Participation

Introduction: National Bike Month is an opportunity to celebrate the unique power of the bicycle and the many reasons people choose bicycles as their mode of transportation or for recreation.

Action Item/Recommendation: All State Departments and Agencies should support, and as much as possible, encourage staff to participate in National Bike Month activities that are hosted by local groups across the state. In addition to attending and participating in local events, the NCDOT should develop an interactive website for participants to log and share their experiences as they shift their mode of transportation. This would be similar to the WalkBikeNC Challenge that took place

during the development of this Plan.

The State should encourage employers and school systems to offer incentives to employees and students who participate in National Bike Month activities and Walk to School Day events to promote initiative and reward their participation. For example, the State should encourage school districts to partner with parents to organize bicycling trains and walking school buses for the children who will participate in Walk to School Day. Each group of students should be led safely to school by a parent or teacher volunteer. Additionally, the State should also encourage employers to allow flexible work days to employees participating in National Bike Month.

Type: Ongoing

Lead Facilitator(s): North Carolina Department of Transportation in partnership with the DPI; local municipalities; school districts; and private employers

Bicycle Commuter Services

Introduction: This program is modeled on Bicycle Colorado's Bicycle Commuter Services (BCS) webpage. Bicycle Colorado offers a "program designed to educate entire workplaces about bicycling to work. BCS is aimed at employers who want to demonstrate good corporate citizenship while simultaneously maximizing cost savings and productivity in supporting healthier, happier and more productive employees. Through our program, employees will learn everything they need to know in order to commute to work comfortably, safely and efficiently. This is done through a combination of classroom and on-bike training. We have found that combining education sessions with on-the-road skills demonstrations is most effective at turning

employees into confident bicycle commuters."

Action Item/Recommendation: The State of North Carolina should partner with local bicycling advocacy groups to develop a program similar to Bicycle Colorado's Bicycle Commuter Services and offer the program to State Departments and Agencies, , regional and local government agencies, private employers and retailers.

Type: Ongoing

Lead Facilitator(s): North Carolina Department of Transportation in partnership with the Department of Commerce; and DHHS

Walking or Bicycling Youth Engagement Contest

Introduction: Fun and interactive statewide competitions educate and engage students about the benefits of bicycling and walking. Each year the state should coordinate with the school districts to schedule a poster, Photovoice, YouTube, and other audio/visual media contest and develop the "scoring" criteria for the audio/visual media. Students in grade four, five, or six would be the best age group for this contest, and the state and school districts should determine which grade (or grades) should participate. Once the details of the contest have been clearly defined, the students should be tasked with creating media that highlights the benefits and value of walking and/or bicycling. Students could be asked to include their favorite place to bicycle or walk to in their town, or where they have enjoyed bicycling or walking in another town in North Carolina. A selection panel made up of representatives from NCDOT, other state departments, and the participating school districts will choose the winner of the contest. The Engagement Contest could be launched





- ▲ In Jacksonville, NC, crossing guard training provides guidance to communities interested in employing crossing guards at schools.

during a “Take A Child Outside” week, or as part of the Walk to School Day event. Each of these initiatives helps educate and encourage children to learn about environmental stewardship while connecting with nature during a walk or outdoor activity.

Type: Ongoing

Lead Facilitator(s): North Carolina Department of Transportation in partnership with the DPI

Bike-Repair Programs

Introduction: By providing well-maintained bicycles to members of the program, bicycle-repair programs encourage use and empower people to make more trips by bicycle. Many programs have also served to teach bike safety, maintenance, and on-road skills and have encouraged more people to bicycle for exercise, transportation, and leisure. In addition, these programs have increased the visibility of bicycling in communities. Community bike-repair programs take different forms, but typically are run by local community groups. These groups acquire and are donated used bicycles that are then repaired by and for lower-income residents, who are offered training for the repairs and an option to volunteer for earn-a-bike programs. Example programs such as “bicycle recyclery”, or “earn a bike” already exist as potential models that extend bike ridership and ownership to lower income populations.

Action Item/Recommendation: The State should develop a tool-kit of model programs for different size municipalities and offer training workshops to local municipal officials and staff who wish to use the state’s model to develop a local program. One successful example of a bike-repair program is the Carrboro Recyclery.

Type: Ongoing

Lead Facilitator(s): North Carolina Department of Transportation in partnership with local municipalities; and BPACs

Communicate Maintenance Schedules

Action Item/Recommendation: NCDOT Division Offices should provide early notification to regional planning organizations (MPOs, RPOs, COGs) and municipalities of maintenance/restriping schedules. Annual meetings should be held when updated maintenance/restriping schedules are released to allow for face to face conversation between local staff and NCDOT Division staff. This information would allow the local governments an opportunity to provide input regarding their needs and support for accommodation measures such as restriping to include bicycle lanes and other relevant markings.

Type: Ongoing

Lead Facilitator(s): North Carolina Department of Transportation Division Offices in partnership with regional planning organizations (MPOs/RPOs/COGs); and local municipalities

ENFORCEMENT PROGRAMS, INITIATIVES, STRATEGIES

Enforcement is critical to ensure that motorists, bicyclists, and pedestrians are obeying common laws. It serves as a means to educate and protect all users. The goal of enforcement is for bicyclists, pedestrians, and motorists to recognize and respect each other's rights on the roadway. In many cases, officers and citizens do not fully understand state and local laws for motorists, bicyclists, and pedestrians, making targeted education an important component of every enforcement effort.

Purpose

According to the Alliance for Biking and Walking, North Carolina ranks 41st out of the U.S.'s 50 states for pedestrian safety and 44th for bicycling safety. Enforcement programs are a key tool in improving bicyclist and pedestrian safety, as well as improving perceptions of safety. As one of its goals, this Plan seeks to "create and maintain safe, efficient, and accessible pedestrian and bicycle accommodations as fundamental elements of North Carolina's transportation network to provide mobility, recreation, and physical activity opportunities to all North Carolinians." Meeting that goal requires a commitment to inter-agency cooperation in enforcing the state's laws as they relate to bicyclists and pedestrians, educating all road users about state and local laws, and monitoring trends in roadway safety for bicyclists and pedestrians.



Existing & Past Efforts

Crash Data Tool

Introduction: Through a contractual partnership with NCDOT, the Highway Safety Research Center (HSRC) administers the NC Crash Data Tool. This involves yearly updating, geocoding, analyzing, and maintaining roughly 900 bicycle collision reports and 2,600 pedestrian collision reports. Agencies around the state are routinely using the crash data tool for information.

Type: Ongoing

Action Item/Recommendation: This Plan recommends continuing the Crash Data Tool program and expanding promotion of the tool as a resource for agencies and organizations around the state. Expanded promotion will add to the value of the program and also reduce any redundancy created by local agencies establishing their own means of crash data analysis. NCDOT should ensure that an explanation of the tool and its uses and availability is included in all Safe Routes to School activities, Complete Streets Workshops (or other design workshops), safety related manuals and guidebooks, and is incorporated into planning efforts funded by the Planning Grant Initiative.

Lead Facilitator(s): North Carolina Department of Transportation; Highway Safety Research Center

Bicycle and Pedestrian Law Manuals and Guidebooks

Introduction: In addition encouragement and education focused manuals (discussed previously in this Chapter); NCDOT's Division of Bicycle and Pedestrian Transportation has developed two informative guidebooks focused on legal matters related to bicyclists and pedestrians:

- *Guide to NC Bicycle & Pedestrian Laws*
- *NC Bicycle Helmet Campaign Guide*

The guides have not been updated in recent years. The materials are not actively marketed, but are available online. When first published, NCDOT provided copies of the Guide to NC Bicycle and Pedestrian Laws to law enforcement agencies around the state.

Type: Ongoing

- ▼ *With safe pedestrian and bicycle facilities in place, children and parents can feel confident about walking and biking more often.*



Action Item/Recommendation: The *Guide to NC Bicycle and Pedestrian Laws* is a particularly important and popular item and should receive an update bi-annually to ensure consistency with current laws. NCDOT should assign the role of updating the manual to a specific staff person within the agency to ensure the information is updated every two years. The designated staff person should also establish opportunities for promoting the manual within existing NCDOT programs, such as Safe Routes to School and the Planning Grant Initiative.

Recognizing the passage of the mandatory helmet law for youth in NC (2001), this Plan recommends that NCDOT discontinue the NC Bicycle Helmet Campaign Guide.

Lead Facilitator(s): North Carolina Department of Transportation

School Crossing Guard Training Manual

Introduction: The School Crossing Guard Training Manual is a tool for crossing guard trainers to lead instruction workshops for crossing guards. Elements covered in this manual include crossing procedures, characteristics of children in traffic, responsibilities of the crossing guard, emergency procedures, signalization and traffic signs, professional guidelines, and legal issues. The manual has not received an update since 2001, with the exception of adding changes to the MUTCD component of the manual.

Type: Ongoing

Action Item/Recommendation: The *School Crossing Guard Training Manual* serves an important role for law enforcement agencies responsible for training crossing guards. Before updating the training manual, this Plan

recommends that NCDOT conduct a brief survey of agencies responsible for crossing guard training and identify preferred training methods and current needs related to crossing guard training. The surveying process can include targeted interviews, as well. Currently in North Carolina, local communities choose what agency is responsible for training the guards. Conducting the survey will allow NCDOT to better respond to the differences in approaches to training throughout the state. Based on the survey's results, NCDOT will update the manual and establish bi-annual targeted workshops to "train the trainers" of crossing guards.

Lead Facilitator(s): North Carolina Department of Transportation



"Watch For Me NC" Pedestrian Campaign

Introduction: The "Watch For Me NC" campaign is intended to improve pedestrian safety by influencing the behaviors of drivers and pedestrians through safety messaging and enforcement. The program is currently targeted to the Triangle region of North Carolina. The effort was launched in 2012 through Transportation Enhancement funding provided by NCDOT and federal funds provided by the National Highway Traffic Safety Administration. The four municipalities of the Triangle region have provided

substantial support for and participation in the campaign. The four major universities and their campus police departments have also been very supportive of this effort. Funding and expansion for the bicycle component will be launched in 2013.

Fall 2012 Update: The Bike30 Unit along with the Traffic Unit conducted a Pedestrian Operation at the intersection of Gregson St and Lamond Ave. They conducted the operation at the same place and same time as they conducted the informational checkpoint the day before. They cited 13 drivers with “Failure to Yield to Pedestrian in a crosswalk”, 1 driver was charged with Driving with license revoked, 1 driver was charged with Driving with no license, and 1 driver was arrested and charged with two FTA’s (Failure to Appear). The unit was approached and thanked by several pedestrians, and citizens of the area. (Sergeant B. M. Massengill, Durham Police Department)

Type: Ongoing

Action Item/Recommendation: The Triangle region “Watch for Me NC” pedestrian campaign has been well-supported and successful. This Plan recommends that NCDOT fund the Triangle region “Watch For Me NC” campaign for the 2013 year and establish a strategic plan for expanding the program to all regions of the state. Based on the Triangle region’s successful program model, create a “toolkit” for implementing the program in other regions and use localized versions of the materials created for the Triangle region. When expanding the program to other regions, provide one year of funding for program development and provide guidance on utilizing local staff and resources to bolster the program, as was done in the Triangle region. Pedestrian and bicyclist safety, rights and etiquette, along with street crossing rules,

traffic signal messages and meanings, and how to follow and obey pavement markings should be taught to children and adolescents to increase their safety and reduce automobile-pedestrian crashes in North Carolina. Courses should be developed and incorporated into the physical education curriculum in elementary schools and middle schools.

As part of the strategic expansion plan the State should consider increasing funding for this program and expand its reach in three distinct ways:

- 1) Develop a communications strategy with specific goals for increasing the number of children exposed to the program through active promotion to schools and teachers;
- 2) Expand the program to include bicycle-related information and materials; and
- 3) Create an online interactive version of the bicycle and pedestrian safety materials that will be attractive to each of the targeted age groups.

Example: Existing program in Oregon

Bicycle Transportation Alliance’s Pedestrian Safety Enforcement Mini-Grants program:

ODOT funds enable enforcement agencies throughout the state to stage crosswalk enforcement actions educating motorists, cyclists, and pedestrians on crosswalk laws. In these operations, a decoy police officer attempts to cross a street at an intersection or marked crosswalk. (Crosswalk laws apply to unmarked crosswalks as well.) If passing motorists fail to stop and yield for the pedestrian they are issued either a warning or a citation. The operations include a media outreach component, with the purpose of raising awareness around motorist, cyclist, and pedestrian responsibilities.

Lead Facilitator(s): North Carolina Department of Transportation in partnership with DHHS; the DPI; Department of Crime Control and Public Safety; North Carolina State Highway Patrol; municipal and county police departments; local political jurisdictions; local municipalities; and school districts

New Program Recommendations

Installation of Red-Light Cameras

Action Item/Recommendation: Red light cameras should be installed at high traffic volume intersections and at historically unsafe intersections where vehicular-pedestrian and vehicular-bicyclist crashes have occurred. A red-light camera is connected to the traffic signal and to sensors at the intersection stop line that monitor traffic flow. The camera is triggered by any vehicle entering the intersection above a preset minimum speed and following a “grace period” of time after the signal has turned red. The State should determine the appropriate “grace period” for cars to pass through the intersection after the light has turned red. Violations are mailed to the person listed on the vehicle registration.

NCDOT should install red-light cameras on state routes and highways and should encourage local municipalities to consider the installation of red-light cameras on priority local roads. Red-light camera violation fees are utilized in many different ways in different states. For example, violation fees in Florida are used to fund research to cure paralysis. NCDOT should consider collecting red-light violation fees in a designated multi-modal traffic safety fund and the funds should be used to create safer corridors for all roadway users.

Type: Ongoing

Lead Facilitator(s): North Carolina Department of Transportation in partnership with the State Highway Patrol

Automated Speed Enforcement Devices & Systems

Introduction: Automated speed enforcement devices and systems can be an effective tool for managing speed and reducing speed related crashes. Some devices record and visibly display vehicle speed, and other devices capture a real-time photo of traffic as well as devices record and visibly display vehicle speed. Most devices use radar and motorists with a radar detector in their vehicle will be alerted of the presence of the radar. This program would change motorists behavior and encourage safe driving, responsible driving, staying alert, and obeying the posted speed limit.

Action Item/Recommendation: NCDOT should install permanent, fixed photo speed enforcement devices. If permanent, fixed photo speed enforcement devices are too expensive to consider at the statewide level, mobile photo speed units may be a more affordable option for North Carolina.

Type: Ongoing

Lead Facilitator(s): North Carolina Department of Transportation in partnership with the State Highway Patrol

Bicycle and Pedestrian Needs Checklist

Action Item/Recommendation: The State should create a Bicycle and Pedestrian Needs Checklist as an additional



phase in the project design process. A Bicycle and Pedestrian Needs Checklist would ensure the full participation and timely review of the NCDOT Bicycle and Pedestrian Transportation staff in the development of new projects which have the potential to benefit cyclists and pedestrians. One component of the checklist would be to increase bicycle and pedestrian related amenities at intermodal facilities and any existing or future Park & Ride facilities. Adding amenities such as bicycle parking racks can make multimodal travel easier and more seamless. There are many examples of Checklists available online in the form of Complete Streets checklists. Elements from the example Checklists below should be considered for inclusion by the NCDOT. Below are a few example resources:

- http://www.seattle.gov/transportation/compSt_how.htm
- http://www.mtc.ca.gov/planning/bicyclespedestrians/routine_accommodations.htm
- www.state.nj.us/transportation/capital/pd/documents/CompleteStreetsChecklist.doc

Type: Ongoing

Lead Facilitator(s): North Carolina Department of Transportation Division Offices in partnership with regional planning organizations (MPOs, RPOs, COGs), county planning departments; and municipal planning departments

Facility Inspection and Maintenance

Action Item/Recommendation: The State should set minimum standards for acceptable sidewalk and bicycle facility conditions. Setting and maintaining minimum condition standards will enable all users to use facilities safely. Establish standards for maintenance of bikeways including replacement of worn pavement markings and damaged signs, sweeping

away debris, repaving streets and repairing potholes. The State should encourage municipalities to require sidewalk inspection when properties are sold to reduce liability for property owners, who can be held liable if someone is injured on the sidewalk in front of their property. The State should set-up a hotline to effectively and efficiently collect information regarding problematic facilities.

Type: Ongoing

Lead Facilitator(s): North Carolina Department of Transportation in partnership with municipalities













PROGRAMMATIC RECOMMENDATION REVIEW TABLE

The table that begins on page 7-28 illustrates how each recommendation in this Chapter serves a specific function or role in the diverse toolkit of programmatic efforts that NCDOT should pursue to enable people to walk and bicycle more, and lead healthier lives. Each of the five pillars (Mobility, Safety, Health, Economics, Environment) that guide this Plan are shown in the table, along with the programmatic recommendations associated with it.

Program Name		Mobility	Safety	Health	Economics	Environment
EDUCATION	ONGOING					
	Bicycle Helmet Initiative					
	Let's Go NC - Bicycle and Pedestrian Curriculum					
	Safety Education Materials					
	Share the Road Posters					
	Safe Routes to School Community Workshop					
	Bicycle Planning and Design / Pedestrian Planning and Design Workshops					
	Designing Pedestrian Facilities for Accessibility					
	Streetwise Cycling - Guide to Safe Bicycling in North Carolina					
	Pedestrian Safety Roadshow					
	Walkable Communities Conferences					
	Workshops and Webinars					
	Bicycle Law Enforcement Education for Police					
	Statewide Bicycle Skills Training for Adults					
NEW	"Train the Trainers" - Bicycle Skills Training for Child Care Personnel					
	Bicycle Rodeo Kit					
	Drivers Education Training					
	Bicycle and Pedestrian Facility Design Seminars					



Program Name		Mobility	Safety	Health	Economics	Environment
ONGOING	Bicycle/Pedestrian Commuter Incentive Programs					
	Safe Routes to School Program					
	Bicycle Events - A Community Guide					
ENCOURAGEMENT	Bicycle Parking Installation					
	Safe Routes to School (Regional Plans)					
	Weekend Walkabouts					
	Campus Commuter Program					
	National Bike Month and Walk to School Day Support/Participation					
	Bicycle Commuter Services					
	Walking or Bicycling Poster Contest					
	Bike-Repair Programs					
	Communicate Maintenance Schedules					

Program Name		Mobility	Safety	Health	Economics	Environment
ENFORCEMENT	ONGOING					
						
						
						
						
	NEW					
						
						

8 Benchmarking & Accountability

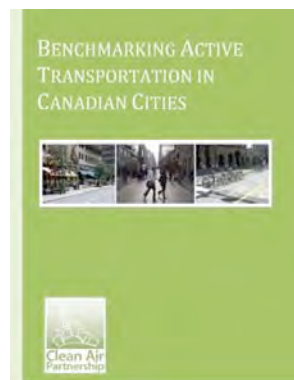
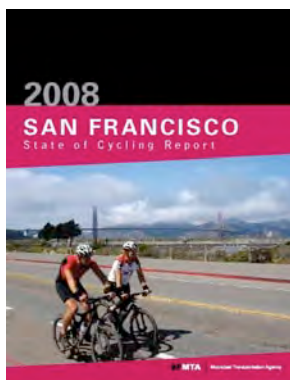
MEASURING PROGRESS

The evaluation measures in this chapter reflect best practices of the world's leading walking and bicycling communities. Higher priority performance measures, or metrics, are discussed first. A comprehensive table, inclusive of the high priority metrics, follows with each potential measure listed. An indication is given as to whether the data for such a measure in North Carolina 1) are readily available, 2) require collection and organization of existing information, or 3) require a new data collection program.

This chapter's Performance Measures Table should be used as a resource by NCDOT and other agencies and organizations who wish to measure progress related to the goals of this Plan. An annual benchmarking report should be developed by NCDOT-DBPT, using at least the measures that are readily available. Each year, the report could be expanded to include other measures, with the help of other agencies and organizations. The implementation of an annual benchmarking program in North Carolina will be essential in tracking progress towards the goals of *WalkBikeNC* and it will demonstrate the benefits provided to communities throughout the state.

Measuring performance over time will allow the State to measure how it is doing in providing quality pedestrian and bicycle transportation choices. It will also provide a mechanism for making informed decisions and efficient investments. An annual benchmarking report will also be a valuable reference for project planners seeking state, federal or grant funding assistance, helping to build upon previous successes.

Example Walking and Bicycling Annual Benchmarking Reports ▼



In this Chapter

Measuring Progress

Pedestrian and Bicycle Metrics for the 21st Century

System-wide Performance Categories and Metrics Table

Project-specific Performance Categories and Metrics Table

Comprehensive Performance Measures Toolbox

Mobility

Safety

Health

Economics

Environment

PEDESTRIAN AND BICYCLE METRICS FOR THE 21ST CENTURY

Today, in North Carolina, pedestrians and bicyclists do not have a viable, equivalent quality transportation choice other than the use of the automobile in the current statewide transportation system. A distinct current and accruing need exists for safety, mobility, and infrastructure health across North Carolina in all three geographic tiers. There is a lack of a consistent, connected, accessible, and safe pedestrian and bicycle network across the state, region, and cities of North Carolina making walking and bicycling a difficult choice in transportation for most places across the state. In addition, pedestrians and bicyclists are more limited by distances to key destinations, a factor largely influenced by local land use decisions.

Pedestrians and bicyclists include a wide range of types, ages, capabilities, and skill levels. To effectively deliver pedestrian and bicycle transportation to North Carolinians, NCDOT must consider the range of pedestrians (See Chapter 3) and bicyclists (See Chapter 4). A customer-service approach that addresses the specific needs and requirements of the broad range of pedestrians and bicyclists is necessary for NCDOT to deliver bicycle and pedestrian transportation effectively to North Carolinians.

Each North Carolina transportation customer faces basic decisions for travel to destinations that are influenced by a number of factors. A motorist is not as influenced by distance and presence of roadway facilities because an automobile can move faster and go farther with fewer obstacles to travel, and the roadway network is interconnected and continuous, accessing destinations. A pedestrian or bicyclist is influenced by distance traveled

and lack of interconnected facilities due to travel speed, capability of cyclist or pedestrian, and the fact that the network of walkways and bikeways often do not exist in many places throughout North Carolina.

A comprehensive approach that goes beyond facilities is needed to deliver to the pedestrian and bicyclist customers. In addition, as the 2040 Plan recommends, NCDOT will continue pursuing its mission of “connecting people and places safely and efficiently, with accountability and environmental sensitivity to enhance the economy, health, and well-being of North Carolina.” Adhering to the NCDOT mission statement and delivering quality pedestrian and bicycle accommodations includes both quantitative and qualitative metrics:

- A connected network of pedestrian and bicycle facilities, that includes crossing roadways and other landscape features
- Implementation of Complete Streets policy with a comprehensive design toolbox for each unique project needs and requirements
- Implementation of regional and local pedestrian and bicycle plans
- Land use-transportation integration
- Projects that improve safety, health of citizens, statewide economy
- Education, encouragement, and enforcement programs

To determine if pedestrian and bicyclist needs are being met, a more comprehensive approach to metrics and performance measures is needed to build upon current LOS measurements. This approach should address the above

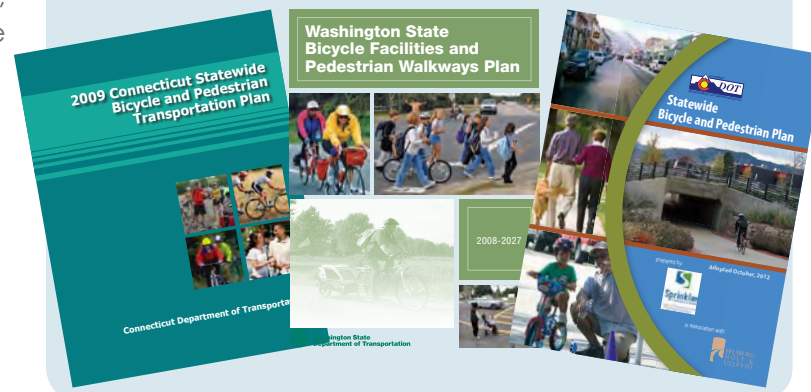


necessities in both a system-wide (statewide/regional) level and project-specific (local) level. In many cases, this will be possible with additional data collection.

The following performance metric guides were developed utilizing precedent guidance from other states. The first two tables represent higher priority performance measures and are organized by the NCDOT Accountability Framework. The final, lengthy toolbox is meant to be an exhaustive, comprehensive list of performance measures to be considered for use in the long-term.

Best Practices in Performance Metrics

States have established basic performance measures to be accountable to their customers. These measures are data-driven and have required states to allocate additional resources towards data collection. These best practices and new measures were combined to derive the pedestrian and bicycle metrics for North Carolina.



▲ Pedestrian forced to use roadway where sidewalk gap exists in Jacksonville, NC.










































▲ Pedestrian crossing a roadway with poor curb ramps, no marked crosswalk, and no pedestrian signalization in Burlington, NC.

System-wide Performance Categories and Measures (Statewide/Regional Tier)

Performance Category	Performance Measure	Data	States
MOBILITY			
Mobility: Usage/health	Pedestrian and bicycle commute mode share	Readily available (already used)	LA, TN, OR, WA, MT, CO
Mobility: Usage/health	Percentage of trips made by bicycling and walking	Requires new collection	VT, MN, CO, WA
Mobility: Facilities	Percentage of state-owned roadways that have sidewalks	Requires new collection and organization	OR, WA, VT, AL
Mobility: Planning/Policy	Regions/MPOs/Counties/Municipalities with bicycle/pedestrian/greenway plans	Readily available (already used)	WA, TN, AL, CT, AZ
Mobility: Planning/Policy	Regions/MPOs/Counties/Municipalities implementing local bike/ped policies	Requires further data collection and organization	CO, CT
Mobility: Planning/Policy	Counties/cities implementing local bike/ped policies	Requires further data collection and organization	AZ
Mobility: Planning/Policy	Compliance with Complete Streets Policy (NCDOT staff)	Requires data collection	WA (qualitative)
Mobility: Planning/Policy	Percentage of eligible roadway projects built as Complete Streets	Requires data collection	----
Mobility: Planning/Policy	Customer pedestrian and bicycle counts	Requires data collection	IN
Mobility: Facilities	Percentage of transit, rail, and ferry hubs with complete access amenities for bike/ped	Requires data collection	PA (goal)
Mobility: Facilities	Percentage of state-owned roadways that have designated and/or separated bicycle facilities (paved shoulders, bike lanes, cycle tracks)	Requires data collection and organization (already used but requires additional collection)	TN (% paved shoulder), OR, WA, AL
Mobility: Facilities	Percentage of signalized intersections with pedestrian crossing signals on state-owned roadways (within municipalities)	Requires data collection and organization	AZ (desired not obtained)
HEALTH			
Mobility: Usage/health	Physical inactivity rates/obesity rates	Readily available (already used)	IN, VT, MN, CO
Mobility: Usage/health	Percent of projects that are ADA-compliant	Requires data collection	PA

Performance Category	Performance Measure	Data	States
SAFETY			
Safety	Pedestrian and bicyclist crash and fatality rates (per capita)	Readily available (already used but requires better collection)	TN, WA, VT, CO, AZ
Safety	Pedestrian and bicyclist crash and fatality rates (per capita) relative to other states	Readily available (already used but requires better collection)	TN, WA, CO, NV
Safety: Education and encouragement programs	Number of schools participating in pedestrian and bicycle safety education/encouragement events (Example: Safe Routes to School)	Requires new collection	LA (# of SRTS projects), WA, VT, CO
Safety: Education and encouragement programs	Increase in walking and bicycling to schools	Requires new collection	VT, CO
Safety: Education and encouragement programs	Cities, businesses, and universities designed as Bicycle and Walk Friendly by League of American Bicyclists and the Highway Safety Research Center	Readily available	CO (count, not list)
ECONOMIC GROWTH			
Economics	Return-on-investment measure (small business development, tourism, home prices, individuals)	Requires new data collection program	IN, CO, NV, CT
ENVIRONMENT			
Environment	Percentage of planning and design efforts that utilize Conservation Planning Tool	Requires data collection	----
Environment	Reduction in transportation-related emissions due to increase in walking/bicycling trips	Requires data collection	WA, CO, CT
Mobility: Facilities	Miles of shared-use paths	Requires data collection	MA, IN, VT, AL, NV
ACCOUNTABILITY			
Mobility: Planning/Policy	Percentage of customers satisfied with pedestrian and bicycle transportation	Requires data collection	OR (cite old sources), WA, IN, CO, NV

Project-specific Performance Categories and Measures (Sub-Regional/Local Tier)

Performance Category	Performance Measure	WalkBikeNC Plan Pillars/Goals	Data	NCDOT Accountability Framework
Mobility: Usage/health	Quality of improvement, measured by pedestrian or bicycle LOS	  	Requires new collection	Moving People and Goods
Mobility: Usage/health	Percentage of trips made by bicycling and walking on project corridor	  	Requires new collection	Moving People and Goods
Mobility: Usage/health	Physical inactivity rates and obesity rates in county/city/locale		Readily available	Healthy Communities
Safety	Project would result in safety improvement as quantified by FHWA Crash Reduction Factors		Readily available	Healthy Communities
Mobility: Facilities	Project connects to an existing pedestrian and bicycle facility	 	Requires data collection	Connectivity
Mobility: Facilities	Project located along or parallel to congested roadway	  	Readily available	Choices
Mobility: Facilities	Provides direct connection to transit service	  	Requires data collection	Connectivity
Mobility: Facilities	Project is multi-use path near larger populations	 	Requires data collection	Connectivity
Mobility/Safety: Planning/Policy	Counties/cities implementing local bike/ped policies	    	Requires further data collection and organization	Connectivity
Mobility/Safety: Planning/Policy	Compliance with Complete Streets Policy (NCDOT staff)	    	Requires data collection	Choices
Safety: Education and encouragement programs	Local schools participating in pedestrian and bicycle safety education/encouragement events (Example: Safe Routes to School)	 	Requires data collection	Healthy Communities
Safety: Education and encouragement programs	Increase in walking and bicycling to local school	  	Requires data collection	Healthy Communities
Mobility/Safety: Training	Total number of NCDOT staff and local officials participating in education/training/enforcement for project	 	Requires data collection	Organizational Responsibility
Economics	Project located in Downtown, "Main Street" area, and/or promotes tourism		Requires data collection	Prosperity
Environment	Project results in local emission reduction		Requires data collection	Resource Protection
Environment	Project connects to trail or park		Readily available	Resource Protection
Mobility: Planning/Policy	Customer pedestrian and bicycle counts		Requires data collection	Accountability

Case Study: National Bicycle and Pedestrian Documentation Project (www.bikepeddocumentation.org)

One of the greatest challenges facing the bicycle and pedestrian field is the lack of documentation on usage and demand. Without accurate and consistent demand and usage figures, it is difficult to measure the positive benefits of investments in these modes, especially when compared to the other transportation modes such as the private automobile. An answer to this need for data is the National Bicycle & Pedestrian Documentation Project, co-sponsored by Alta Planning and Design and the Institute of Transportation Engineers (ITE) Pedestrian and Bicycle Council. This nationwide effort provides a consistent model of data collection and ongoing data for use by planners, governments, and bicycle and pedestrian professionals.

Methodology: The basic assumptions of the methodology are that, in order to estimate existing and future bicycle and pedestrian demand and activity, agencies nationwide need to start conducting counts and surveys in a consistent manner similar to those being used by ITE and other groups for motor vehicles.

Program Forms and Materials Available Online:



1. Count and Survey Forms:
 - Data Collection Instructions
 - Forms
 - Data Entry Spreadsheet
2. Training materials for count/survey program administrators:
 - Counts Training Presentation
 - Surveys Training Presentation
3. Training materials for count/survey volunteers
 - Volunteer Training Presentation - Counts
 - Volunteer Training Presentation - Surveys

COMPREHENSIVE PERFORMANCE MEASURES TOOLBOX

WalkBike NC Plan Pillars	Performance Measure	Indication of Progress Towards Desired Change or Outcome	Readily available	Requires collecting/organizing existing information	May require new data collection program
Mobility	Output				
◆	Cities/MPOs/Counties with existing, and new or updated bike/ped/greenway plans	Increase in number of cities/MPOs/RPOs/Counties with existing, and new or updated bike/ped/greenway plans	✓		
◆	Percentage of state-owned roadways that have designated on-road bicycle facilities by facility type (bike lanes, shared-lane markings, etc.)	Increase in percentage of roadways with bicycle facilities by type statewide		✓	
◆	Percentage of state-owned roadways that have sidewalks	Increase in percentage of roadways with sidewalk		✓	
◆	Percentage of signalized intersections with pedestrian crossing signals on state roads (within municipalities)	Increase in percentage		✓	
◆	Cities/MPOs/Counties with local bike/ped policies (see online survey results from the WalkBikeNC survey for municipalities)	Increased or enhanced legislation for walking and bicycling (ex. Complete streets ordinances, bike parking minimums, development codes)		✓	
◆	Employee compliance with department's commitment to CS policy and guidelines	Number of employee performance plans with complete streets-compliance annual objectives		✓	
◆	Bike/ped access to transit	Percentage of transit, rail, and ferry hubs with complete access amenities for bike/ped			
◆	Number of NCDOT staff and local officials participating in pedestrian and bicycle design (Complete Streets design) training	Increase in number of people participating in design training	✓		

◆ Indicates higher priority performance measure/metric to be utilized by NCDOT and its partner agencies.



WalkBike NC Plan Pillars	Performance Measure	Indication of Progress Towards Desired Change or Outcome	Readily available	Requires collecting/ organizing existing information	May require new data collection program
	New pieces of statewide bike/ ped legislation	Increased or enhanced legislation for walking and bicycling (ex. three-foot passing rule, vulnerable roadway user act, etc.)	✓		
	Miles of signed and designated bicycle routes	Increase in number of signed and designated bicycle routes statewide		✓	
	Number of bike share systems, number of bikes/kiosks	Increase in number of bike share systems and number of bikes/kiosks		✓	
	Number and percent of buses/ trains with bike racks	Increase in number and percent of buses/trains with bike racks		✓	
	Number of training sessions on pedestrian and bicycle accommodation and design and number and type of participants (NCDOT staff, consultants, regional planning commissions, and local officials)	Increase in sessions and number of participants		✓	
	Miles of paved shoulders on state-owned roads	Increase in number of shared-use paths on state-owned roadways			✓
	Number of bike racks (existing/ installed, off-street/on-street corrals, secure parking areas/bike stations, bike racks at transit)	Increase in number of bicycle racks and other parking types provided			✓
	State/county/city funds spent on pedestrian/bicycle infrastructure/ programs	Increase in funding			✓
	Grant funding received for pedestrian/bicycle infrastructure/ programs (esp. federal, private partnerships)	Increase in funding			✓

WalkBike NC Plan Pillars	Performance Measure	Indication of Progress Towards Desired Change or Outcome	Readily available	Requires collecting/ organizing existing information	May require new data collection program
Mobility	Outcome				
◆	Pedestrian and bicycle commute mode share (from ACS)	Increase in pedestrian and bicycle mode share by type of trip (e.g., commuter, shopping, school, etc.)	✓		
◆	Percentage of trips made by bicycling and walking	Increase in percentage of trips made by bicycling and walking	✓		
◆	Cities, businesses and universities designated as Bicycle Friendly	Increase in cities, businesses and universities designated as Bicycle Friendly	✓		
	Number of bike share trips taken	Increase in number of bike share trips		✓	
	Annual statewide bike/ped counts (see case study p. 8-10)	Increase in number walking and bicycling			✓
	Transit ridership	Increases in transit ridership, especially with new pedestrian and bicycle facilities; Increases in the number of para-transit riders using fixed-route public transit due to improved access to stops and stations			✓
	Number bike/transit trips taken on buses/trains with bike racks	Increase in number bike/transit trips taken on buses/trains with bike racks			✓
	Use of new or experimental facility types				✓
Safety	Output				
◆	Number of schools participating in pedestrian or bicycle safety education programs or events. (e.g., Safe Routes to School, Bike Smart, etc.)	Increase in the number of schools participating	✓		
	Number communities participating in the "Watch for Me NC" safety campaign	Increase in number of communities participating in the "Watch for Me NC" safety campaign	✓		
	Number of bike/ped advocacy groups in NC	Increase in number of bike/ped advocacy groups in NC	✓		

◆ Indicates higher priority performance measure/metric to be utilized by NCDOT and its partner agencies.

WalkBike NC Plan Pillars	Performance Measure	Indication of Progress Towards Desired Change or Outcome	Readily available	Requires collecting/ organizing existing information	May require new data collection program
	Number of students participating in pedestrian or bicycle safety education programs or events. (e.g., Safe Routes to School, Bike Smart, etc.)	Increase in the number of students participating		✓	
	Student walk/bike mode share (from SRTS schools)			✓	
	New striped crosswalks/RRFBs/ audible pedestrian signals/other crossing treatments installed	Increase in number installed			✓
	New ADA curb ramps upgraded/ installed	Increase in number installed			✓
Safety	Outcome				
✦	Pedestrian and bicycle crash and fatality rates (police-reported pedestrian and bicycle crashes per unit)	Reduction in number of crash and fatality rates	✓		
✦	Pedestrian and bicycle crash and fatality rates (per capita) relative to other states	Reduction in crash and fatality rates relative to other states		✓	
✦	Number of children walking and bicycling to schools	Increase in walking and bicycling to schools			✓
	Total number of pedestrian and bicycle crashes	Reduction in number of crashes	✓		
	Pedestrian and bicycle crashes in areas with low vehicle ownership and low average household income	Reduction in number of crashes		✓	
	Vehicle speeds on identified corridors	Lower vehicle speeds on identified corridors			✓
	Driver and pedestrian awareness of pedestrian laws/compliance (e.g., yielding to pedestrian in crosswalk)	Increase in awareness/compliance			✓

✦ Indicates higher priority performance measure/metric to be utilized by NCDOT and its partner agencies.

WalkBike NC Plan Pillars	Performance Measure	Indication of Progress Towards Desired Change or Outcome	Readily available	Requires collecting/ organizing existing information	May require new data collection program
Health	Output				
	Number of physical activity education and encouragement programs focused on walking and bicycling, and number of participants	Increase in number of programs and participants		✓	
Health	Outcome				
◆	Physical inactivity rates (BRFSS)	Reduction in rates	✓		
◆	Obesity and diabetes rates (BRFSS)	Reduction in rates	✓		
	Pedestrian and bicyclist deaths as a proportion of total traffic mortality	Decrease in proportion	✓		
	Number of asthma-related emergency room visits	Reduction in asthma-related emergency room visits		✓	
	Number of emergency room visits from bicycle and pedestrian crashed	Reduction in bicycle and pedestrian-related emergency room visits		✓	
	Percentage of North Carolinians reporting walking and bicycling for leisure (BRFSS)	Increase in rates		✓	
	Private bicycle ownership (% of households)	Increase percentage			✓
	Number of minutes per day the average North Carolina resident spends doing pedestrian and bicycle activity (potentially from self-reported physical activity)	Increase in time spent			✓

◆ Indicates higher priority performance measure/metric to be utilized by NCDOT and its partner agencies.



WalkBike NC Plan Pillars	Performance Measure	Indication of Progress Towards Desired Change or Outcome	Readily available	Requires collecting/ organizing existing information	May require new data collection program
Economics	Output				
	Number of chambers of commerce in NC promoting walking and bicycling as an amenity (using website info)	Increase in number promoting		✓	
	Number of visitors bureaus in NC promoting walking and bicycling as an amenity (using on website info)	Increase in number promoting		✓	
	Number of major walking or bicycling events in NC	Increase in number of events		✓	
	Number of developers in NC promoting walkability and bikability as key features in their developments (based on home builder and realtor surveys)	Increase in number promoting			✓
	New residential or commercial developments near new or existing bicycle/pedestrian infrastructure projects				✓
Economics	Outcome				
♦	Comprehensive return-on-investment measure (small business development, tourism, home prices, individuals)	Increase in return-on-investment			✓
	State ranks high in various livability, tourism, entrepreneurship, and business attractiveness rankings			✓	
	Temporary jobs from new bicycle/pedestrian infrastructure projects				✓

♦ Indicates higher priority performance measure/metric to be utilized by NCDOT and its partner agencies.

WalkBike NC Plan Pillars	Performance Measure	Indication of Progress Towards Desired Change or Outcome	Readily available	Requires collecting/ organizing existing information	May require new data collection program
	Number of businesses locating in NC at least partially due to quality of life related to walking, bicycling, and trail-related amenities	Increase in number of businesses			✓
	Number of visitors coming to NC or vacation in NC at least partially due to walking, bicycling, and trail-related amenities	Increase in number visiting and vacationing			✓
	Economic impact of major walking or bicycling events	Increase in impact			✓
	Number of bike shops	Increase in number of bike shops			✓
	Retail sales rates	Increase in retail sales in areas where with pedestrian and bicycle facilities			✓
	Walk/bike scores	Increase in scores, connected to increased real estate values and jobs			
	Market value of real estate development near major new bike/ped facilities (greenways, cycle tracks etc.)	Increase in value			✓
Environment	Output				
◆	Miles of shared-use paths and greenways	Increase in total miles			
◆	Percentage of planning and design efforts using Conservation Planning Tool (CPT)	Increase in percentage			
	Number of miles of trails within State Parks	Increase in total miles	✓		
	Number of miles complete for the East Coast Greenway	Increase in total miles	✓		
	Number of miles complete for the Mountains-to-Sea Trail	Increase in total miles	✓		

◆ Indicates higher priority performance measure/metric to be utilized by NCDOT and its partner agencies.

WalkBike NC Plan Pillars	Performance Measure	Indication of Progress Towards Desired Change or Outcome	Readily available	Requires collecting/organizing existing information	May require new data collection program
	Number of miles complete for the Carolina Thread Trail	Increase in total miles	✓		
◆	Amount of pollutants not released into the atmosphere by replacing automobile trips with walking and bicycling trips (derived from census mode-share)	Increase in amount of pollutants not released		✓	
Environment	Outcome				
	Number of people using trails in NC	Increase in number of users			✓
	Improved air quality	Decrease in measured air pollutants			✓



9 Implementation

Little Sugar Creek Greenway, Charlotte, NC
(construction)

OVERVIEW

In order to make North Carolina a premier state for walking and bicycling that improves health, safety, mobility, economics, and environmental stewardship, a concerted, connected, coordinated and collaborative effort is required. The action steps table in this chapter provides guidance on how NCDOT can turn this vision into reality. The strategy for doing so involves some physical changes to the roadway environment and other landscapes, as well as new government policies and programs. Successful implementation will also require partnerships and support from local governments, regional planning entities, stakeholders, and local pedestrian and bicycle advocates. This chapter will serve as a simple guide, tying all the components of the Plan together, addressing the actions that must be undertaken by NCDOT and its partners.

NCDOT DIVISION OF BICYCLE AND PEDESTRIAN TRANSPORTATION (DBPT)

The NCDOT Division of Bicycle and Pedestrian Transportation (DBPT) will be the lead agency responsible for implementing the recommendations of this Plan. Other divisions within NCDOT, other state agencies, and non-state agencies including MPOs, RPOs, counties, municipalities, and private sector groups will have complementary and significant roles in implementing the recommendations provided within this Plan.

DBPT staff will be charged with identifying and securing non-traditional sources of funding, broadening the work of the planning program, expanding upon federal and state design standards for facility development including revised guidelines for MUTCD, AASHTO, ADA, access to transit, Complete Streets, and supporting Health Impact Assessments. DBPT will work to achieve the goals of this Plan to improve mobility, safety, economic development, health, and environmental stewardship. As defined with the NCDOT 2040 Transportation Plan, DBPT will perform its work program utilizing a larger share of the overall NCDOT budget dedicated for pedestrian and bicycle projects and programs.

In this Chapter

Overview

NCDOT Division of
Bicycle and Pedestrian
Transportation (DBPT)

Partnerships and Strategies

Funding

Project Delivery

Staffing

Accomplishing the recommendations and action steps of this Plan will require the dedication of additional resources for the DBPT. DBPT needs to bolster its ability to be present geographically across the State to participate closely in project scoping and design. DBPT also should expand its ability to address the five pillars of this Plan, including liaisons to DHHS, DENR, and the Department of Commerce. It will be critical for new grant administrators to leverage new and additional pedestrian and bicycle funding.

MORE DETAILS TO COME IN FINAL DRAFT.....

PARTNERSHIPS AND STRATEGIES

Accomplishing the vision and goals of this Plan will require support and collaboration between multiple public and private agencies. The WalkBikeNC Plan's funding partners and stakeholders represent mobility, safety, health, environment, and economic concerns. Ultimately, the goal of making North Carolina a premier state for walking and bicycling accomplishes the goals of all partners and stakeholders. NCDOT will be the lead implementing agency but cannot achieve success on its own.

The chart on the following page represents a broad collaboration and partnership between key agencies and stakeholders and how they fit into the overall team to address North Carolina customers. The detailed objectives, strategies, and performance measures, organized by plan principle/pillar, are featured next and provide substantially more prescriptive guidance and lead agency task assignments.



The broad partnership is shown in this graphic illustration. The following pages highlight key roles of each contributor. NCDOT will be the lead implementation agency.

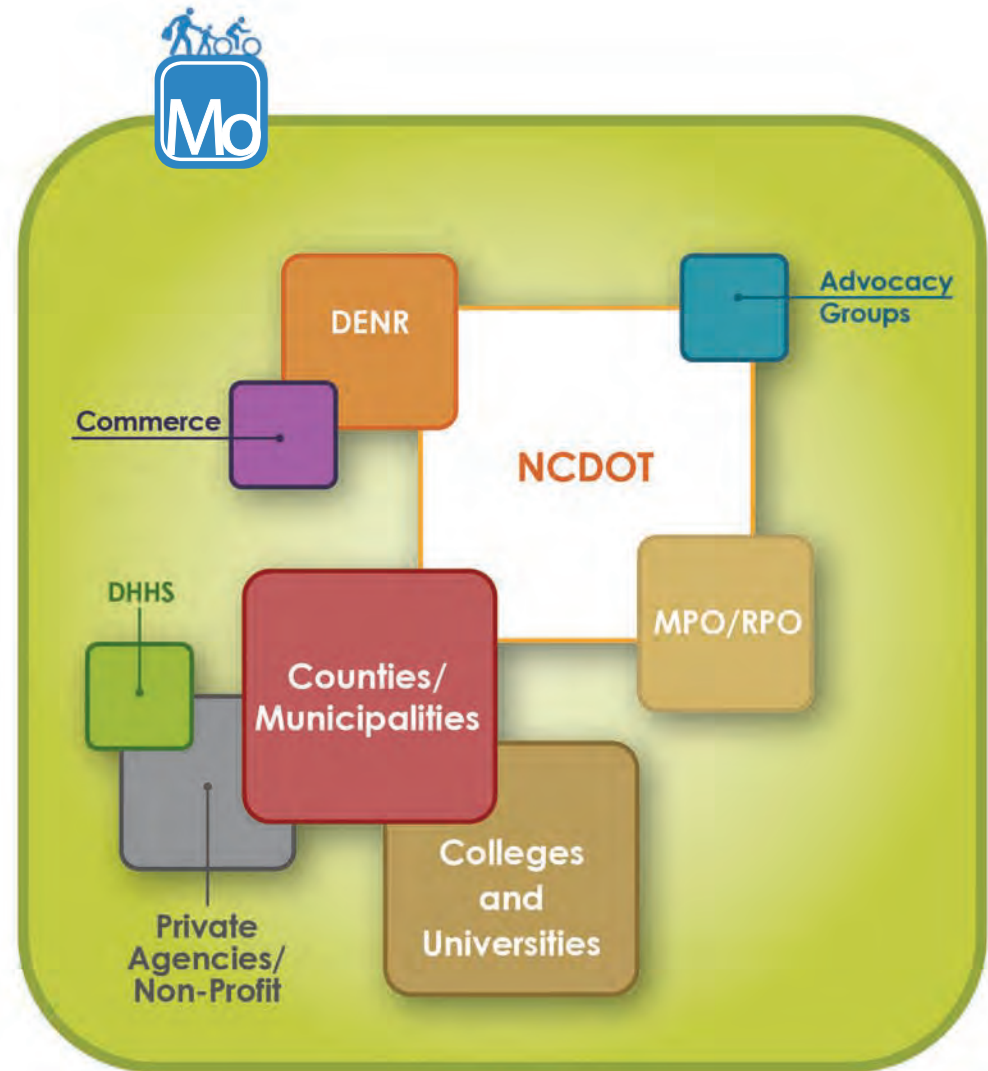




Principle One: Expand Walking and Bicycling Network

NCDOT will work with public and private sector partners to improve the quality of transportation choice for pedestrian and bicycle travel throughout North Carolina by expanding and connecting the local, regional and intrastate network of bicycle facilities, supporting the expansion of community oriented pedestrian facilities, providing better access to transit, and meeting the needs of the disabled in all project work. NCDOT, in partnership with local governments and the private sector, will work collaboratively to streamline pedestrian and bicycle project delivery through a multi-prong approach that focuses on identifying available funding, reducing encumbrances, and implementing the NCDOT Complete Streets Policy.

NCDOT will update the Department of Bicycle and Pedestrian Transportation planning grant program to modernize its function and purpose, create a new category of funding that supports the Americans with Disability Act, focus on corridor and small area grant awards, support grants for countywide pedestrian and bicycle planning, and create new grant funding that supports municipal pedestrian and bicycle programs.



This diagram represents the partnerships and lead agencies necessary to address this principle.

Mobility: Equity, choice, connectivity among transportation modes

Objectives (The WHAT)	Performance Measures (The EVALUATION)	Example Strategies (The HOW)
<ul style="list-style-type: none"> Expand and connect the local, regional and intrastate network of bicycle facilities Expand community-oriented pedestrian facilities Improve transportation equity Provide pedestrian and bicycle access to transit Reduce traffic congestion Improve performance-based program delivery Improve efficiency of technology and planning 	<ul style="list-style-type: none"> Pedestrian and bicyclist mode share Percentage of trips made by bicycling and walking Percentage of roadways that have sidewalks Percentage of roadways that have designated and/or separated bicycle facilities Percentage of signalized intersections with pedestrian crosswalks and crossing signals Regions/MPOs/Counties/Municipalities with bicycle/pedestrian/greenway plans Regions/MPOs/Counties/Municipalities implementing local bike/ped policies Compliance with Complete Streets Policy Percentage of eligible roadway projects built as Complete Streets Percentage of transit, rail and ferry hubs with complete access amenities for bike/ped Percentage of state bike routes with paved shoulder Customer pedestrian and bicycle counts 	<ul style="list-style-type: none"> Increase investment in walking and biking infrastructure Streamline project planning and delivery Complete Streets implementation <ul style="list-style-type: none"> » Update Roadway Design Manual and Bicycle/Pedestrian Facility Design Guidelines » Pass Complete Streets as law Coordinate land use and transportation planning Enhance transit access policies and design to make transit accessible, attractive, and safe for pedestrians and bicyclists Update NCDOT's Bicycle and Pedestrian Transportation planning grant program <ul style="list-style-type: none"> » modernize its function and purpose » create a new category of funding that supports the Americans with Disability Act » focus on corridor and small area grant awards » support grants for countywide pedestrian and bicycle planning » create new grant funding that supports municipal pedestrian and bicycle programs Partner with the League of American Bicyclists to improve the Bicycle Friendly State Program ranking <ul style="list-style-type: none"> » includes annual evaluations and response to successful and unsuccessful programs appropriately to ensure sustainable future investments Establish an evaluation/benchmarking program Partner with colleges and universities to improve data development and technology



Draft Comments: www.surveymonkey.com/s/WalkBikeNC_Draft

- ▲ This plan's strategies were developed from many partners, agencies and advocacy groups across the state. Above: one of many workshops and focus groups that provided input reflected in the strategies and action steps table (found in Appendix 10.10).

NCDOT will work with local governments to improve integration between land use and transportation. Walkability and bikability principles will be inserted into development and growth processes.

NCDOT will build on the success of this Plan to continue engaging and communicating with our customers to ensure that we are meeting the needs of all North Carolinians when it comes to a comprehensive transportation system that serves multi-modal interests.

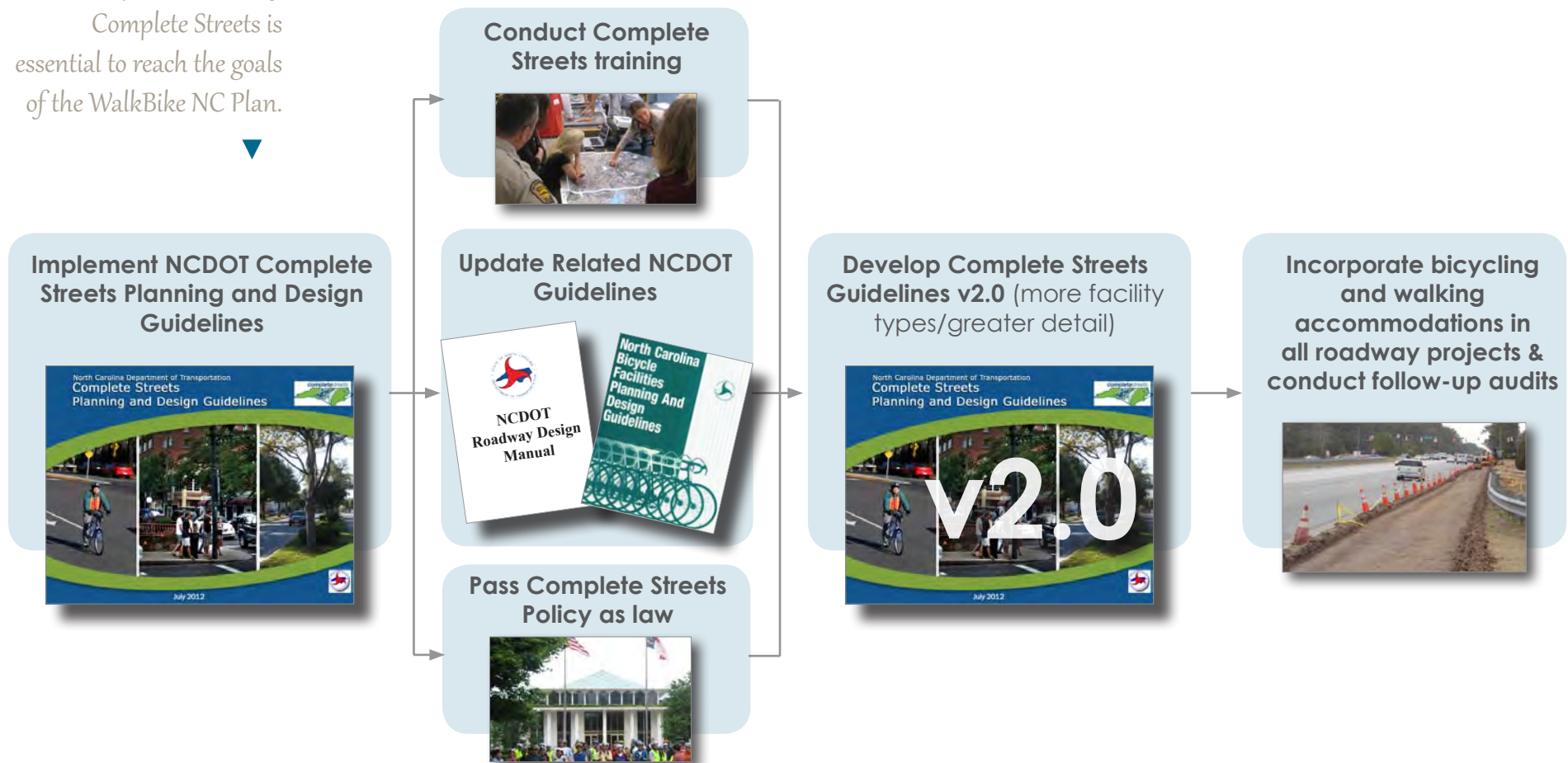
NCDOT will work with colleges and universities to improve data, technology, and web applications that make planning and customer communication more efficient. Web-based applications will be harnessed to provide better customer service. Practitioners, advocates, and residents will be able to access pedestrian and bicycle information.



National recognitions such as Walk Friendly Communities and Bicycle Friendly Communities/Businesses/Universities are clear signs that pedestrian and bicycle mobility needs are being addressed. These programs serve as an effective means for evaluating progress.



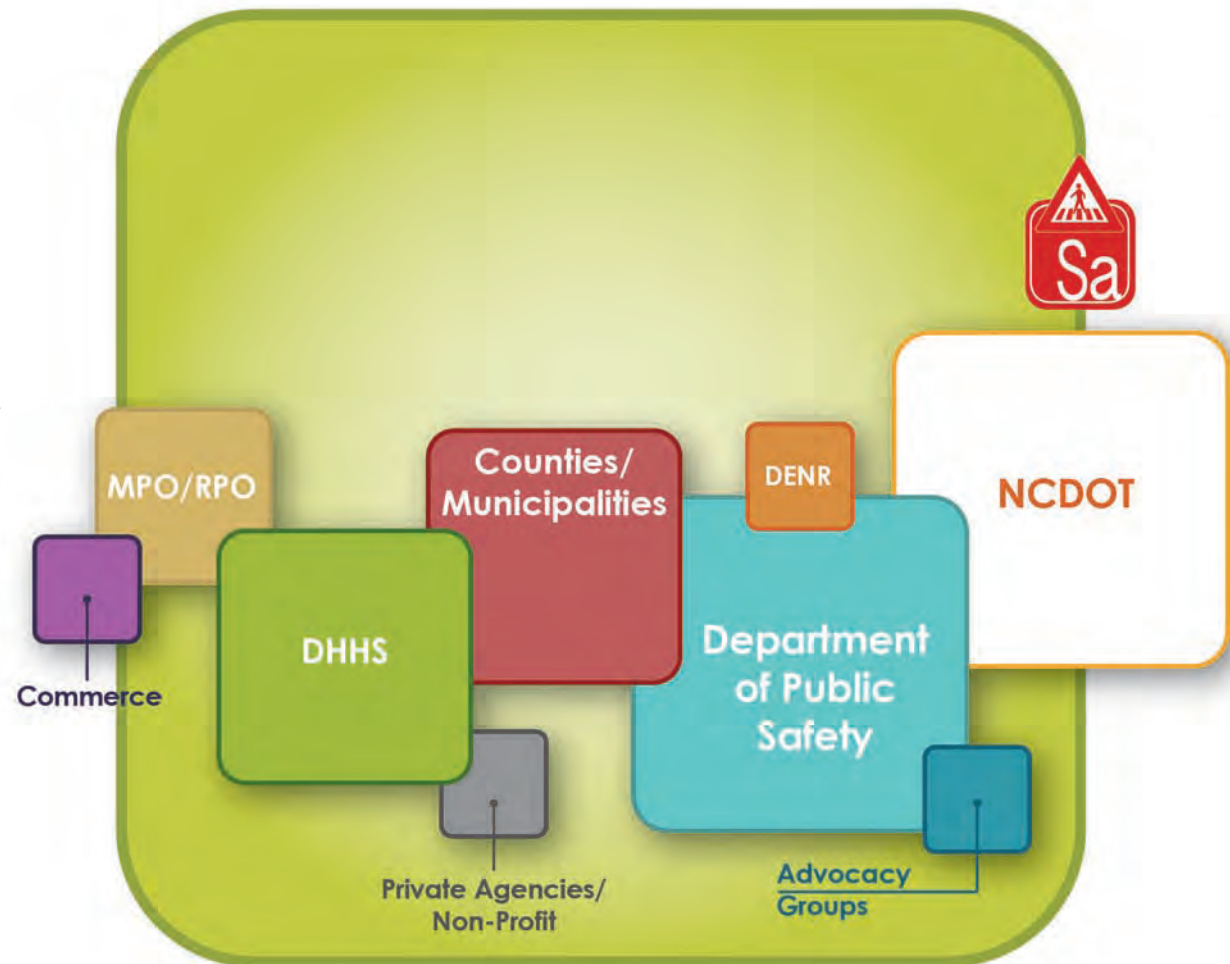
Diagram of strategy from Principle #1. The implementation of Complete Streets is essential to reach the goals of the WalkBike NC Plan.





Principle Two: Improve Public Safety for Walking and Bicycling

A primary goal of this Plan is to improve safety for all roadway users through strategic, consistent and interconnected pedestrian and bicycle facility improvements, along with appropriate policies and strategies for accident prevention, education and enforcement. NCDOT and the North Carolina Department of Public Safety will work cooperatively with municipalities and law enforcement to implement the recommendations defined within this Plan.



This diagram represents the partnerships and lead agencies necessary to address this principle.

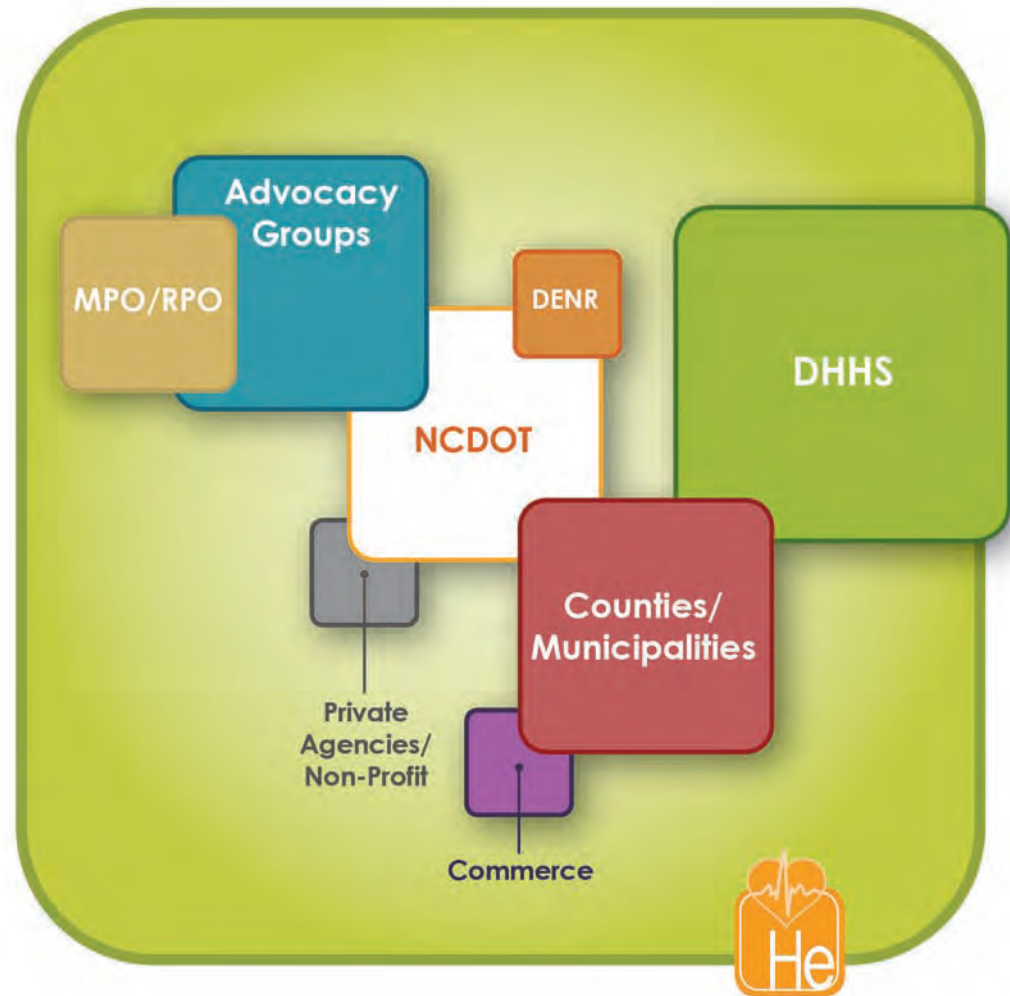
Safety: Public safety for pedestrians and bicyclists

Objectives (The WHAT)	Performance Measures (The EVALUATION)	Example Strategies (The HOW)
<ul style="list-style-type: none"> Create a strategic, consistent, and connected pedestrian and bicycle network Improve safety of pedestrians and bicyclists Increase and improve enforcement of motorist/bicyclist/pedestrian laws to ensure law abidance Improve crash data reporting and mapping and preventative/pro-active safety strategies 	<ul style="list-style-type: none"> Pedestrian and bicyclist crash and fatality rates (per capita) Pedestrian and bicyclist crash and fatality rates (per capita) relative to other states Number of schools participating in pedestrian and bicycle safety education/encouragement programs Cities, businesses, and universities designated as Bicycle and Walk Friendly by the League of American Bicyclists and the Highway Safety Research Center 	<ul style="list-style-type: none"> Make strategic facility improvements Use greater portion of HSIP for pedestrian and bicycle projects Improve enforcement efforts Continue education programs (including rights of the road) Develop policies and strategies for accident prevention Expand Safe Routes to School program Use FHWA Crash Modification Factors Build partnership between NCDOT, DHHS, and Department of Public Safety Establish evaluation/benchmarking program



Principle Three: Embrace Health and Wellness as a Vital Transportation Purpose

North Carolina must embrace a diversified statewide transportation program that contributes significantly to improved public health and wellness by providing and supporting the development of active living environments with safe, connected and accessible transportation facilities. The Department of Health and Human Services and NCDOT will work cooperatively with local health organizations, insurance companies and health care providers to implement the recommendations in this Plan to ensure that North Carolina's transportation system becomes part of successful intervention solutions.



This diagram represents the partnerships and lead agencies necessary to address this principle.

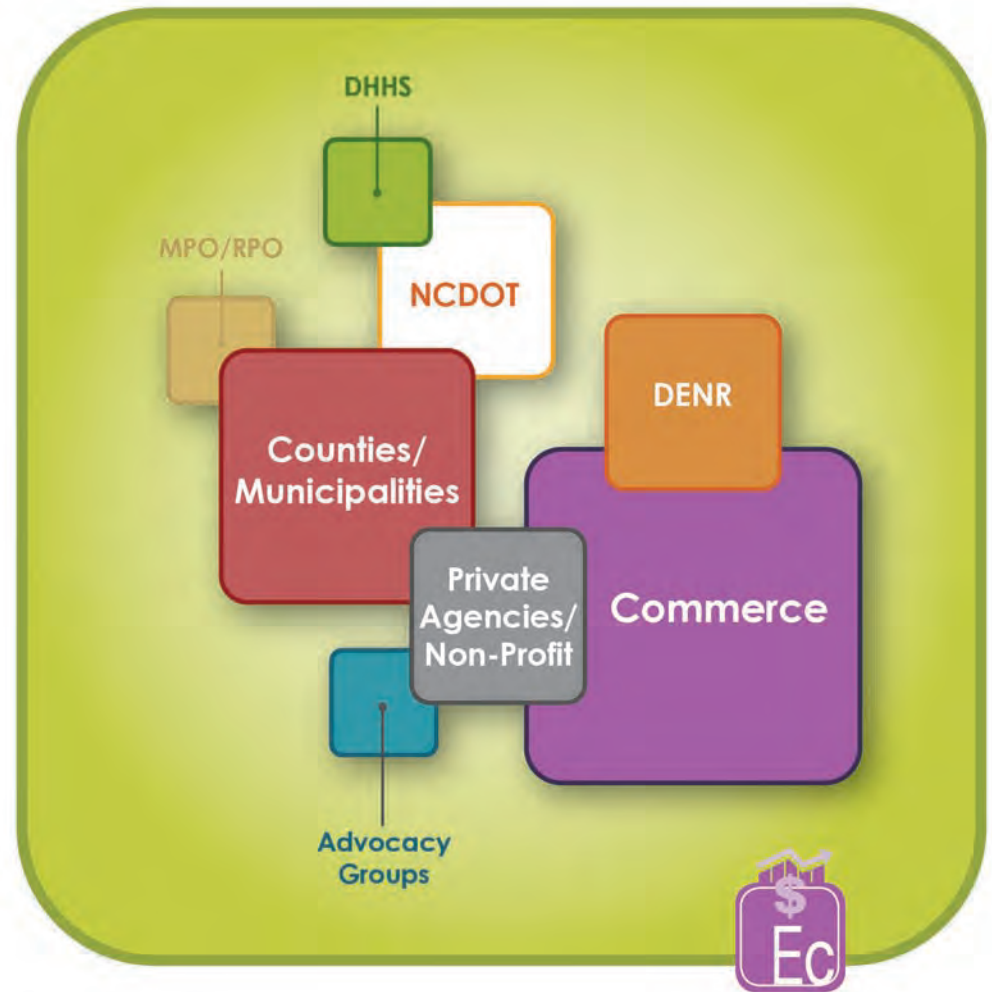
Public Health: Public health and wellness

Objectives (The WHAT)	Performance Measures (The EVALUATION)	Example Strategies (The HOW)
<ul style="list-style-type: none"> • Increase active living environments • Increase the safety, connectivity and accessibility of the bicycle and pedestrian network • Improve public health outcomes • Increase ADA compliance 	<ul style="list-style-type: none"> • Physical inactivity rates • Obesity rates • Pedestrian and bicyclist crash and fatality rates (per capita) relative to other states • Health care costs • Percent of projects that are ADA-compliant 	<ul style="list-style-type: none"> • Implement programs that encourage walking and bicycling • Involve health policy practitioners in project scoping and development • Continue DHHS Community Transformation Grant and NCDOT SRTS partnership • Incorporate HIAs into transportation projects • Expand education, encouragement, and enforcement programs • Build partnerships between NCDOT, DHHS, local health departments, health organizations, insurance companies, and health care providers. • Incorporate Public Right of Way Accessibility Guidelines into transportation development practices, strategies, and implementation • Establish evaluation/benchmarking program



Principle Four: Foster Robust Economic Development by Promoting Walking and Bicycling

North Carolina can maximize economic competitiveness, and return on transportation investment, by creating more accessible, attractive, walkable and bikeable communities. Walking and bicycle facilities and programs have been shown to stimulate job growth across North Carolina. The Department of Commerce will work with NCDOT, North Carolina visitors and convention bureaus, chambers of commerce, local governments and private sector interests to build on the broad partnership that was created to prepare this WalkBike NC Plan and explore ways in which we transform our state to become a national and international destination for bicycle and pedestrian tourism.



This diagram represents the partnerships and lead agencies necessary to address this principle.

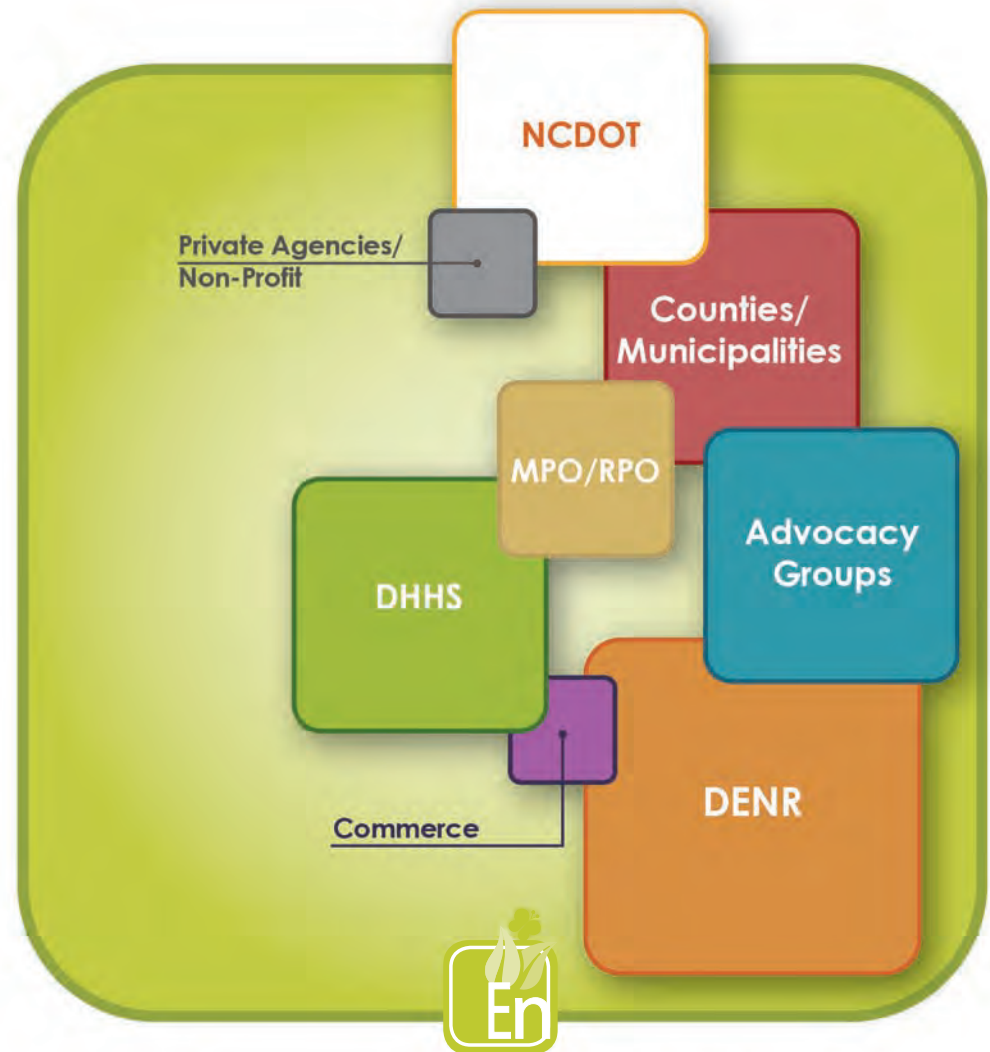
Economic Competitiveness: A Robust Economy

Objectives (The WHAT)	Performance Measures (The EVALUATION)	Example Strategies (The HOW)
<ul style="list-style-type: none"> • Use transportation investment to support economic development and job creation • Increase attractiveness and quality-of-life through walkable and bikable communities • Measure return on investment of active transportation investments • Become a national and international destination for bicycle and pedestrian tourism • Use return on investment analyses to inform transportation decision-making • Leverage effective funding strategies for active transportation investment to meet long-term needs 	<ul style="list-style-type: none"> • Return-on-investment measures <ul style="list-style-type: none"> » Tourism » Property Values » Job Creation » Small business development » Individual quality-of-life measures • Percentage of project costs supported by local funding, public-private partnerships, and/or other cost recovery mechanisms • New business start-ups due to walkability and bikability of community 	<ul style="list-style-type: none"> • Promote walking and bicycling • Enhance web presence at www.visitnc.com and www.accessnc.com • Expand Main Street Program to include Complete Streets design elements • Build partnerships between NCDOT, Department of Commerce, visitors and convention bureaus, chambers of commerce, local governments, and private sector • Initiate North Carolina-based return on investment analyses and post-construction assessment for active transportation infrastructure to inform decision-making • Diversify the funding stream that supports investment in bicycle and pedestrian facility and program development • Establish evaluation/benchmarking program



Principle Five: Encourage Stewardship of North Carolina's Natural & Cultural Resources

North Carolina's land, air and water resources are the foundation of quality living, economic prosperity and community identity. NCDOT is committed to conserving and protecting North Carolina's natural and cultural heritage while at the same time providing world-class transportation facilities and programs. To accomplish these goals, the Department of Environment and Natural Resources will work with NCDOT to utilize the Conservation Planning Tool (CPT) for transportation planning and design. North Carolina should continue its national leadership in local, regional and statewide greenway development by completing a Greenprint for North Carolina.



This diagram represents the partnerships and lead agencies necessary to address this principle.

Stewardship of our Environment: Conserve and protect North Carolina's natural and cultural heritage

Objectives (The WHAT)	Performance Measures (The EVALUATION)	Example Strategies (The HOW)
<ul style="list-style-type: none"> Reduce automobile dependence Increase the active transportation linkages between the state's natural and cultural resources Conserve and protect North Carolina's natural resources Expand statewide greenway network 	<ul style="list-style-type: none"> Percentage of planning and design efforts that utilize Conservation Planning Tool Reduction in transportation-related emissions due to increase in walking/bicycling trips Miles of greenways/shared-use paths 	<ul style="list-style-type: none"> Complete a Greenprint for North Carolina Expand the statewide network of greenways that links key cultural and natural heritage activity centers (could be economic, too) Build partnerships between NCDOT, DENR, DWQ, CTNC, DPR, land trusts, and non-profits. Utilize the Conservation Planning Tool (CPT) for transportation planning and design Update and coordinate trail design guidelines (NCDOT, DENR, DWQ) Establish evaluation/benchmarking program



Partnerships like those between DENR, FMST, and hundreds of volunteers have led to the successful development of Mountains-to-Sea Trail segments. Above: Trail near Clingmans' Dome in the Great Smoky Mountains.

FUNDING

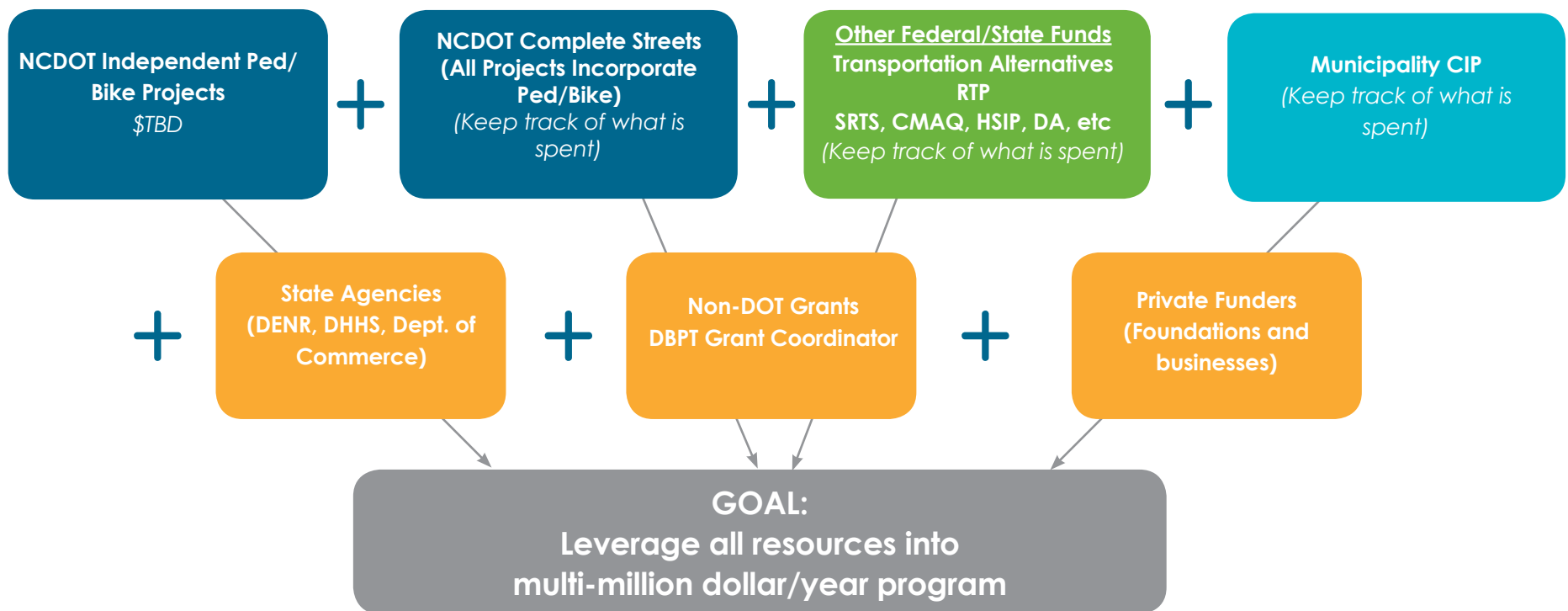
With pedestrian and bicycle customer need clearly expressed in this Plan, additional funding is needed to improve the current LOS "D." This can be achieved in two clear ways: 1) Implement Complete Streets as common practice in new construction and reconstruction so that pedestrian and bicycle improvements are included elements in projects, not just incidentals, and 2) Build and retrofit pedestrian and bicycle facilities to improve connectivity, safety, and mobility.

One of the greatest challenges of North Carolina's transportation infrastructure is paying for the cost of network expansion, recurring operations, and maintenance. It is necessary to diversify the funding stream that supports investment in bicycle and pedestrian facility and program development by inviting and encouraging a broader range of public and private sector funding partners at the local, subregional, regional and state level. The NCDOT 2040 Plan defines the need to better relate revenues and funding to mode share. Currently, there is a significant unmet need for pedestrian and bicycle facilities throughout North Carolina. NCDOT and its partners are committed to funding pedestrian and bicycle projects and programs in a manner that reduces the unmet customer need. Financial support is needed from local governments and the private sector to address and resolve this unmet need.

Further, NCDOT should develop methods of tracking the funds spent on walking and bicycle facility improvements and programs so that it is possible to benchmark the success of the financial commitment and support for pedestrian and bicycle transportation.

The funding chart on the following page demonstrates the future comprehensive and diversified approach necessary to move forward.

Pedestrian and Bicycle Funding Chart: New Federal Transportation Bill (Map-21)



CMAQ - Congestion Mitigation and Air Quality
DA - Directly Attributable; RTP - Recreational Trails Program

SRTS - Safe Routes to School
CIP - Capital Improvement Program

HSIP - Highway Safety Improvement Program
DBPT - Division of Bicycle and Pedestrian Transportation

PROJECT DELIVERY

Building upon Strategy One described previously, NCDOT will need to focus on improved, efficient, and customer-service driven project delivery. The following strategies below provide additional detail to what was described as part of Strategy One.

Sub-Strategy One: Institutional Awareness and Responsibilities

It is essential for NCDOT to embrace the Complete Streets policy and philosophy in all future work. States that are known for successful pedestrian and bicycle programs view pedestrian and bicycle elements as essential to the success of a roadway project. NCDOT staff have operated for many years with pedestrian-bicycle facilities considered ancillary and readily dropped to accommodate concerns about ROW acquisition/expense, environmental permitting, or other issues. Key action steps include:

1. Update Roadway Design Manual to include prescriptive guidance on comprehensive slate of pedestrian and bicycle design treatments.
2. Update NCDOT Bicycle Facility Design Guidelines and develop Pedestrian Facility Design Guidelines.
3. Require pedestrian and bicycle training, with support of ITRE, and require education credits to be met every two years.

Sub-Strategy Two: New Programs to Get Facilities On-the-Ground

1. *Modify projects that are currently included in the State Transportation Improvement Program (STIP) to improve pedestrian and bicycle outcomes.* In keeping with the principles of complete streets (and previous efforts such as “inclusion”, “incorporation”, and “mainstreaming”) standard features of streets and roadways should accommodate bicyclists and pedestrians as incidental parts of larger highway and street projects. All projects that are not past the “design public hearing” stage should be reviewed and upgraded as needed using regular project funds in order for them to, at a minimum, meet NCDOT’s complete streets policy.

The additional budget described above should not be used to accomplish this task. However, the additional funding could be used to improve projects in the STIP under two specific scenarios. The first involves projects that are past the design public hearing stage. These projects should be assessed on an ongoing basis to determine if additional pedestrian and bicycle features could be added without interrupting the project schedule and timeline. Using the additional funds for this purpose would create near term “on the ground” improvements while not undermining each District’s responsibility to design complete streets projects moving forward. It could also provide valuable lessons learned as District’s go through the process of upgrading the design of projects in the STIP.

The second scenario, where using additional funds to improve projects in the STIP, identifies and funds projects



that are considered “over and above” treatments based on the scope of the project. An example might be adding a short path segment on a street reconstruction project to connect to a library even though the project already includes bicycle lanes and sidewalks. In this case, additional funds may be needed to acquire additional right-of-way and they will increase project costs. Another example is a bicycle and pedestrian underpass that could be added to a project even though at-grade crossings of the street are also planned.

2. Develop a Sidewalk Retrofit Program

A sidewalk retrofit program would install sidewalks as stand-alone projects not connected to an adjoining road project. Such a program would allow NCDOT to add sidewalks along state highways where there are existing gaps in the sidewalk network or where there is a demonstrated need for sidewalks. This program would be done in addition to the existing prioritization process. The program would likely be outside of the STIP, to proactively add sidewalks where need is greatest. A set of parameters would need to be developed to determine those priorities. A number of details are important for ensuring that a sidewalk retrofit program functions well:

- The program should be run as a competitive grant program. Projects should be nominated by local municipalities or the Division offices. Local municipalities and the regional offices will be the most familiar with areas where sidewalks are needed to complete a pedestrian network, provide connections to transit, or meet an observed need.
- The program should be targeted to roads that have been resurfaced/reconstructed within the last 5 years.

Projects along roads that are older than that should have sidewalks added with the next major project performed on the road as part of the Department's Complete Streets effort. These sidewalk projects should be funded as part of the road project, and not through the retrofit program. Exceptions may be made to the project age requirement if there is a strong demonstrated need or safety benefit from providing sidewalks before the next road project.

- A local cost-share may be required as part of the program, but, if used, it should be minimal to encourage participation from local municipalities. A sliding scale could also be considered, for example to ensure that rural areas have access to the program.
- Given the logistical difficulties of managing many small-scale sidewalk programs, grant applications should have to meet a minimum standard for the amount of sidewalk to be constructed in a given area. Alternatively, the program could focus on specific MPOs/RPOs or Regions each year to guarantee that all projects are in the same area.

3. Develop a Shoulder Retrofit Program

A paved shoulder retrofit program would function similarly to the Sidewalk Retrofit Program described above. For this program, projects would be selected to add paved shoulders to a roadway outside of any other work being performed. Paved shoulders provide considerable benefit to bicyclists and pedestrians, but also reduce the amount of maintenance needed on roads, increase safety by providing additional recovery area for motorists, and provide additional space for maintenance crews and emergency responders to operate.

The program should only be used to fund paved shoulders as stand-alone projects. NCDOT Divisions, MPOs/RPOs, and municipalities should have input into the process. State bike routes could also garner a higher priority. New resurfacing and reconstruction projects should typically include paved shoulders as a matter of course.

4. Expand the budget for the existing Highway Safety Improvement Program.

NCDOT's existing Highway Safety Improvement Program (HSIP) provides a venue for the continuous and systematic review and identification of traffic safety concerns throughout the state. Through this process, potentially hazardous (PH) locations are identified. In the most recent analysis, completed in May 2012, 99 potentially hazardous bicycle/pedestrian intersection locations were identified. Each of these locations has a targeted pattern of crashes that can be identified, investigated, and appropriate countermeasures can be developed where applicable. The ultimate goal of the HSIP process is to reduce the number of traffic crashes, injuries, and fatalities by reducing the potential for these incidents on public roadways.

NCDOT could use additional funds to evaluate these locations, identify appropriate countermeasures based on the types of crashes that are occurring, and then implement countermeasures. Depending on resources available, the agency could attempt to evaluate and improve all of the locations, or it could simply increase the quantity of projects that are implemented each year through this program.

Sub-Strategy Three: Improve efficiency through NCDOT internal process/structure

Roadway reconstruction and resurfacing present cost-effective opportunities to incorporate pedestrian and

bicycle facilities. For example, resurfacing projects present opportunities for the addition of bike lanes and marked crosswalks. NCDOT and municipalities must communicate better and more regularly to ensure that pedestrian and bicycle plans, designs, and facilities are incorporated into the design of the roadway improvement.

In addition, NCDOT should consider adding and distributing pedestrian and bicycle positions geographically across North Carolina. This would allow for a more effective and efficient means to incorporate meaningful, context-sensitive pedestrian and bicycle project input. Also, input from the DBPT would become less "external" and a regular, local component of all project processes. This arrangement would be more similar to other State DOTs.

Sub-Strategy Four: Define "shovel-ready" and create process

NCDOT and municipalities deal with pedestrian and bicycle implementation difficulties of ROW acquisition/expense, environmental permitting, or other issues. These issues often provide an obstacle or excuse to not incorporate pedestrian and bicycle facilities. NCDOT should seek to do the following:

- Educate municipalities about what "shovel-ready" means so as to more efficiently receive project requests and get projects built.
- Municipalities should step forward to move projects towards "shovel ready."
- NCDOT should develop implementation/construction process guideline and manual similar to other State DOTs to create a process and describe lessons learned.

